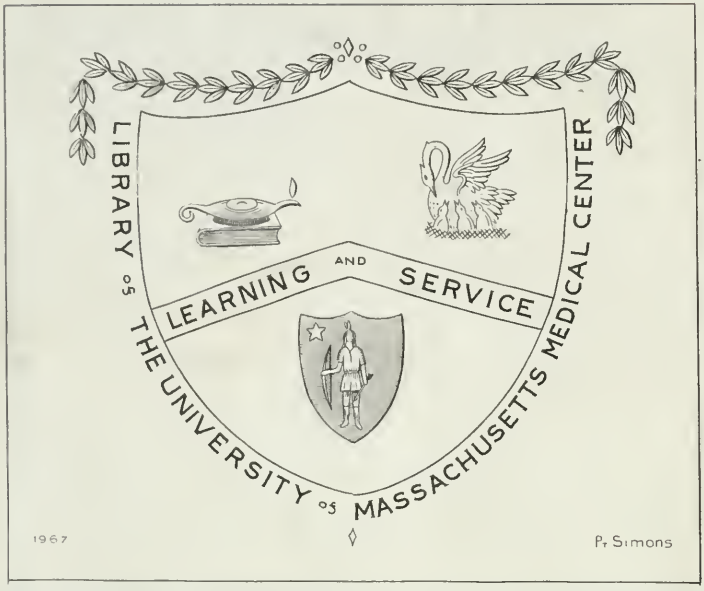
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PRACTICE OF MEDICINE:

A

TREATISE

ON

SPECIAL PATHOLOGY AND THERAPEUTICS.

BY

ROBLEY DUNGLISON, M.D.,

PROFESSOR OF THE INSTITUTES OF MEDICINE, ETC., IN JEFFERSON MEDICAL COLLEGE, PHILADELPHIA; LECTURER ON CLINICAL MEDICINE; ETC., ETC.

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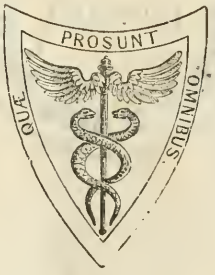

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TO THE

GENTLEMEN,

WHO HAVE HONOURED THE AUTHOR

BY

THEIR ATTENDANCE ON HIS LECTURES,

This Work

IS AFFECTIONATELY INSCRIBED.

ROBLEY DUNGLISON.

-6440

PREFACE TO THE THIRD EDITION.

Since the publication of the second edition of this work, short as the interval has been, so much activity has prevailed in the advancement of medical knowledge, that a thorough revision of it became necessary. Several pathological affections, too, had been omitted, which are now inserted. The greatly enlarged dimensions of the work will sufficiently exhibit the amount of additions, which might escape superficial observation.

In preparing the present edition, the author has carefully scanned the various monographs on pathology and therapeutics, which have appeared alone or in different cyclopædiac and other works, transactions of learned societies, and journals. He has also availed himself of the valuable matter contained in recent treatises having a similar scope with his own, of which he may specify more particularly those of Canstatt,* Fuchs,† and Wunderlich,‡ of Germany; Valleix§ and Grisolle,‖ of France; and Dickson,¶ of this country. The Pathological Anatomy of Vogel,** and the Animal Chemistry of Simon,†† have also yielded him valuable assistance. Nothing of importance that has been recorded since the publication of the last edition has, he believes, escaped his attention; and, altogether, he trusts that the present edition will be regarded as an adequate exponent of the existing condition of knowledge on the important departments of which it treats.

ROBLEY DUNGLISON.

109 South Tenth Street, Nov., 1847.

* Die Specielle Pathologie und Therapie von klinischen Standpunkte aus bearbeitet. Zweite vermehrte Auflage. Erlangen, 1843.

† Lehrbuch der Speciellen Nosologie und Therapie. Göttingen, 1845—1847.

‡ Handbuch der Pathologie und Therapie. Stuttgart, 1846—1847.

§ Guide du Médecin Praticien, ou Résumé Général de Pathologie Interne et de Thérapeutique Appliquées. Paris, 1843—1847.

‖ Traité Elémentaire et Pratique de Pathologie Interne. 8vo. Paris, 1844.

¶ Essays on Pathology and Therapeutics; being the Substance of a Course of Lectures delivered by Samuel Henry Dickson, M.D., &c. &c. Charleston, 1845.

** The Pathological Anatomy of the Human Body, translated by Dr. Day. London, 1847. Or American edition, Philadelphia, 1847.

†† Animal Chemistry, with Reference to the Physiology and Pathology of Man; translated and edited by Dr. Day. Sydenham Society edition, London, 1845—1846; or American edition, Philadelphia, 1846

PREFACE TO THE FIRST EDITION.

The improvements and modifications incessantly taking place in the departments of Pathology and Therapeutics, render it advisable, from time to time, to incorporate them, so as to furnish those to whom the different general treatises, monographs, and periodicals are not accessible, with the means of appreciating their existing condition.

Perhaps at no time has it been more necessary than at present to bring together those various elements: certainly, within the last ten or twenty years, greater activity has been exhibited amongst observers than at any former period, and the researches of recent pathologists have greatly altered the face of the science, in regard to certain lesions more especially. Different views are still entertained on some of these; but they ought all to be familiar to the observer, in order that his own investigations may receive the proper direction, and—what is all-important—that he may know when to remain in doubt.

The departments of Special Pathology and Therapeutics have necessarily occupied a large amount of the author's attention; engaged, as he has been, for upwards of eighteen years as a Medical Professor, and for a much longer period as a practitioner.

His opportunities, too, for witnessing the phenomena presented by disease in both hemispheres, have been varied. During a long service as a medical student in the north of England, in Edinburgh, London, and in Paris; during a practice of six years in London; of eight years whilst he was Professor in the University of Virginia; of three years as Professor in the University of Maryland; and of upwards of five years as Professor in the Jefferson Medical College of Philadelphia, he has carefully noted the modifications that appeared to be produced by climate and locality. Moreover, his service for three years as Physician to the Baltimore Infirmary, and for a longer period as Physician to the Philadelphia Hospital, one of the largest charities in the country, has equally enabled him to appreciate the differences presented by the same malady, according as it may fall under the care of the private practitioner, or of the medical officer of an eleemosynary institution; and to pronounce, as the result of such observation, that the great principles of Pathology and Therapeutics are the same everywhere, and that one, who has been well grounded in those principles, can exercise his profession with as much satisfaction to himself, and advantage to the sick, in the scorching presidencies of British India, as in the more temperate regions of our own country. As in the case of epidemics, differences are observable; but those differences are readily seized and appreciated by the well-educated physician, and the appropriate treatment suggested accordingly. Hence, the medical officers of our army and navy,

and especially the latter, whose duties carry them to every part of the globe, are found to be as successful in the management of the cases that fall under their care in distant regions, as they would be in the treatment of those that prevail in the spot where they received their medical education.

In regard to the execution of the work, the author would merely remark, that he has endeavoured to give a faithful exposition of what he considered to be the existing views in relation to the subjects of which it treats. He is not conscious of possessing any exclusive opinions, and has endeavoured to be essentially eclectic. Neither is he aware of having any undue prejudices. It has been his good fortune to pass, thus far, through life without imbibing unpleasant feelings towards any honourable member of the profession; he has, accordingly, throughout the work felt a pleasure in referring to the labours of observers everywhere, and it has been no little satisfaction to him that he has been called upon so often to make mention of the investigations of those on this side the Atlantic.

In the preparation of such a work, a large amount of labour and of reflection has been necessary; and the author humbly hopes, that it may not be found to have been bestowed in vain.

Philadelphia, January 4th, 1842.

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PRACTICE OF MEDICINE.

BOOK I.

DISEASES OF THE DIGESTIVE TUBE.

The diseases of the digestive apparatus are among the most common to which the attention of the physician is directed. They are diversified in character; are frequently serious, and always occasion considerable discomfort. They are interesting too in their relations. Derangement of function or of structure cannot go on for any length of time in any other apparatus without sooner or later involving the functions of this. The stomach especially participates, and hence it has been often termed the "centre of sympathies." On the other hand, serious derangement of the digestive tube reacts upon other organs, and especially upon those in the immediate vicinity, which pour their secretions into it.

The whole of the digestive tube, from the mouth to the anus, is lined by a mucous membrane, whose functions are identical with those of the lining membranes of other outlets; namely, to secrete a lubricating fluid, which may facilitate the progress of the matters destined to pass over them. In the supradiaphragmatic portion of this mucous membrane, there are no crypts or follicles which demand much attention, excepting those of the pharynx, which are at times greatly enlarged, and give rise to suffering in deglutition.

In the stomach and in other portions of the infradiaphragmatic division of the tube, peculiar secretions take place; in the former, the gastric acids are secreted, which mix with the aliment, and impress the necessary physical changes upon it. In the small intestine, the follicles or glands of Brunner exist; and the aggregate glands or patches of Peyer, which would not seem to differ in their function from the ordinary muciparous crypts, but which have been elevated into importance, as being the seat, according to some, of typhoid fever. In the lower portions, too, of the small intestine, and in the large, follicles exist, that secrete a fluid of an offensive odour, which communicates part of the characteristic smell to the fæces; so that evacuations possessed of fæcal odour may be passed, even when aliment has not been taken to any amount for a considerable period. The exhalation from the mucous membrane and the secretion from the mucous folli-

cles are poured into the canal, and, in addition to these secretions, the fluids from the salivary glands—the parotid, submaxillary, and sublingual—flow into the mouth; and the products of the secretion of the liver and pancreas into the commencement of the small intestine. These are all the glandular secretions that are poured into the digestive tube.

Throughout the whole of the tube, from the pharynx downwards, the muscular coat is situate to the exterior of the mucous coat; and from the lower part of the œsophagus downwards, a movement of peristole—a gentle, oscillatory contraction, alternating with relaxation, and commonly termed "peristaltic action"—is going on from above to below, by which the alimentary and excrementitious matters are urged onwards. The muscular coat varies in its arrangement in different parts of the canal. In the œsophagus, it is thick, especially near the cardiac orifice of the stomach; in the stomach, thin; and, in the small intestine, the fibres are both circular and longitudinal, so that, by the contraction of the former, the contained matters can be pressed upon; whilst, by that of the latter, the length of the intestine to be passed over is diminished. In the first portions of the large intestines—the cæcum and colon—the arrangement is different. The muscular fibres, which proceed longitudinally, are collected into three separate bands or fasciculi; the circular fibres are likewise in fasciculi, and give the colon the saccated or pouched appearance which it is known to present. The effect of this is, that, in the pouches, there are essentially but two coats, the mucous or inner, and the peritoneal or outer. In the rectum, this arrangement does not hold. Its strong muscular coat exhibits that it is adapted for energetic contraction.

The whole appearance of the alimentary canal sufficiently exhibits, that its different parts are destined for different functions. The shape of the stomach shows that it is a place of sojourn, or a reservoir of detention, in which the food undergoes admixture with the supra-diaphragmatic secretions and those from the stomach itself. The character of the small intestines, as seen externally, shows it to be a mere canal for the passage of food along it. It has none of the aspects of a reservoir; but when we inspect the internal surface of the upper portion more especially—the duodenum and jejunum—we notice folds of the mucous membrane, called valvulæ conniventes, whose effect must be to detain the alimentary matter for a longer period than the smooth lower portion of the same intestine—the ileum. These valvulæ have likewise the additional effect of affording a larger surface for the chyliferous vessels, which have their origin, in greatest abundance, in the part of the canal where the valvulæ exist. Here digestion is completed; for, although it may still take place lower down, and to a certain extent even in the cæcum, as has been believed by many, the main digestive operations are certainly *stomachal*, and perhaps *duodenal*. The whole arrangement of the large intestine exhibits, on the other hand, that it is a reservoir, and intended for the detention of the excrementitious matter, until the desire arises to expel it. It is not true, that the excrement always passes onwards into the rectum, and there accumulates. The rectum is generally empty, or contains

but a small amount of fæces, even when the colon may be distended; but when the fæces are very thin, they descend into the rectum, and, were it not for the sphincter, would be constantly passing off. The part which usually acts as a sphincter is the annulus at the top of the rectum, or at the termination of the sigmoid flexure of the colon; and it is important to bear this in mind in certain pathological cases to be referred to hereafter.

When the fæces are detained long in the pouches of the large intestine, and especially in the heat of summer, when the watery portions of the blood are largely thrown off from the cutaneous surface, the liquid parts of the excrement are taken up, and the fæces, when extruded, have the shape of small balls, and are extremely hard. These *scybala*, as they are termed, by remaining in the pouched portions of the colon, may readily become the source of disease in the lining membrane. The arrangement and position of the cæcum facilitates this kind of detention, and gives rise to a form of enteritis, to which attention has been directed chiefly of late years.

Lastly,—inasmuch as the membrane, that lines the canal, extends along the excretory ducts as far as the glandular organs, which have been described as pouring their secretions into the digestive tube, it can be readily seen, that pathological conditions of the former may implicate the latter; and that many of the diseases of the liver and pancreas, for example, may have their origin in the alimentary canal. Thus, agents, which affect the latter, may exert their remedial agency upon the glands through continuity of membrane, without its being necessary to invoke the more operose process of absorption into the mass of blood, and action on the secretory organ through that fluid. In like manner, we can explain how affections of the throat may interfere with audition. Of late years, more especially, the attention of pathologists has been directed to the morbid states of the Eustachian tube, on which many cases of deafness have been found to be dependent. The Eustachian tube opens into the pharynx, and is lined by a prolongation of the pharyngeal mucous membrane. Hence, if inflammation attack the pharynx, it may spread along the tube, and by obstructing it, occasion deafness, either temporary or permanent, according as the obstruction of the tube passes off with the inflammation that caused it, or continues.

On investigating the causes of death in the Philadelphia Hospital Dr. Tabb of Gloucester County, Virginia, found the proportion of deaths from diseases of the alimentary canal and abdominal viscera, during a period of twelve years, to be to the whole number of deaths as 1 to 5. In England, it has been estimated as 1 to 8.

CHAPTER I.

DISEASES OF THE MOUTH.

I. INFLAMMATION OF THE MOUTH.

Synon. Stomatitis; *Fr.* Stomatite, Inflammation de la Bouche; *Ger.* Mundentzündung, Entzündung der Mundschleimhaut.

The mucous membrane of the mouth is liable to various forms of inflammation, which may be simple or erythematous, accompanied by a pseudo-membranous or diphtheritic exudation, or by an eruption; or the follicles of the mouth may become ulcerated, or the stomatitis may end in gangrene. All these pathological conditions it may be well to inquire into separately.

a. *Simple Inflammation of the Mouth.*

Synon. Stomatitis erythematosa; Simple Stomatitis; Erythematous or Erythematic Stomatitis; *Fr.* Stomatite érythémateuse; *Ger.* Einfache Schleimhautentzündung der Mundhöhle.

Diagnosis.—The mucous membrane is unusually red, hot, and dry, and extremely sensible to the contact of foreign bodies, even of the tongue. The redness is commonly in patches, and the affection rarely gives rise to general symptoms. It usually passes off in a few days by resolution, but occasionally terminates in ulceration or gangrene. The latter is not, however, to be anticipated; but induration of the submucous tissue is at times left by it. Ptyalism is not an unfrequent concomitant.

Causes.—The most frequent cause is the ingestion of hot or acrid substances; injuries done to the mouth by bruises, by the operations of the dentist, or by the accumulation of tartar around the teeth. During the age of the first dentition, stomatitis may arise from this source, when it may be accompanied by signs of general pyrexia. Occasionally, too, erythematous stomatitis would seem to be induced by disorder of the tube lower down.

Treatment.—This form of stomatitis generally yields readily. If induced by acrid or hot substances, it passes off spontaneously in a short time. Milk diet and mucilaginous gargles, as of flaxseed tea, or infusion of slippery elm, or a lotion of the white of egg mixed with water, are all that can be demanded. If the stomatitis be dependent upon gastric derangement, it disappears as soon as the derangement ceases. Small doses of magnesia, combined or not with charcoal, may generally be prescribed in such cases with marked benefit.

b. *Diphtheritic Inflammation of the Mouth.*

Synon. Diphtheritic Stomatitis.

This is the stomatitis with altered secretion of some, and ought to include both the thrush or *muguet* of the French writers, and the

pseudo-membranous stomatitis, *stomatite couenneuse* ou *diphthérite buccale.* Both are varieties of the same kind of inflammation of the mucous membrane, but it may be convenient to examine them separately.

1. *Pultaceous Inflammation of the Mouth.*

Synon. Stomatitis exsudativa, S. vesiculosa infantum, Stomapyra, S. Aphtha, Aphthæ of Children, Aphtha seu Aphthæ Infantum, A. Neonatorum seu Lactantium, A. Lactucimen, Lactucimina, Lactumina, White Thrush, Thrush, Milk Thrush; *Fr.* Aphthes des Enfans, Maladie aphtheuse des nouveau-nés, Millet, Blanchet, Muguet, Stomatite Crêmeuse Pultacée; *Germ.* Aphthen der Säuglinge, Schwämmchen der Säuglinge, Mehlmund, Aphthenartige Mundfäule, Soor, bösartigen, pseudomembranosen, falschen Schwämmchen.

Thrush attacks the new-born infant chiefly, although it is described as occurring in the course of certain diseases, as of phthisis in the adult. This last condition, however, is not stomatitis with altered secretion, but the aphthous stomatitis to be described presently.

Diagnosis.—Thrush is easily recognised. The whole of the surface of the tongue exhibits unusual redness, and here and there small curd-like exudations are perceptible, especially behind the lips and about the tip of the tongue: these gradually increase in number, and coalesce so as to form irregular patches, which are thrown off, and renewed, leaving the mucous membrane, from which they are detached, of a vivid red colour. In slight cases, the exudations are discrete; but in the more severe, they always run together, until occasionally the whole of the mucous membrane of the mouth, as well as of the pharynx, and perhaps œsophagus, is implicated. The skin is commonly hot and dry, and the thirst considerable. The disease is usually of but little consequence, and terminates in a few days in health; but in the foundling hospitals, where numbers of children are crowded together in a small space, and where appropiate ventilation and nourishment cannot readily be obtained, it is a serious malady, the inflammation extending down the digestive tube, and in this way proving at times fatal. In the milder cases that occur in private practice, this extension of the disease,—indicated by diarrhœa, with an irritating character of the alvine discharges, occasioning redness and excoriation around the anus,—is an almost constant concomitant.

According to M. Valleix, an erythematous condition of the nates and posterior part of the thighs almost always—that is in 17 cases in 23—precedes the *muguet;* but this has not been the result of the observations of others, who have noticed the phenomena in the mouth before any other.

Causes.—Early period of infancy, imperfect nutrition, and the atmospheric deterioration occasioned by crowding a number of children together within a restricted space, must be ranked among the predispositions. There is evidently, too, in young infants, a greater predisposition in the mucous membrane, when inflamed, to be covered with diphtheritic exudations or concretions. By many, it has been supposed to be propagable by contagion from the nipple; but others are not of this opinion. Children have often been seen to drink from the cup used by others affected with the disease, without receiving it themselves. The author is unable to speak positively from his own experience as to this point.

It has been of late affirmed by M. Gruby, that the thrush is a cryptogamic plant vegetating on the mucous membrane. Remak, however, found, that a single aphtha often contained several species of fungi;—that the species of fungi occurring in different aphthæ in the same individual exhibited no constant relationship; and that while one aphtha contained numerous fungi, others in the same individual contained none. He infers, that the alteration of the mucous membrane is the primary phenomenon, and that the fungi are only produced under favourable physical conditions.

Treatment.—Generally, little more is needed than in simple stomatitis. The mouth may be wetted several times a day with a linen rag dipped in some emollient liquid, as the infusion of the slippery elm, or simply in milk and water. As, however, the lining membrane of the intestinal canal is generally more or less affected, and the source likewise of altered secretions, an occasional dose of magnesia,—alone, or associated with rhubarb,—may be advisable.

A common mouth-medicine, in those cases, is borate of soda mixed with honey, in such proportion as the practitioner may deem advisable:

℞.—Sodæ borat. in pulv. p. i.
Mellis despumat. p. viii.

By some, the mouth is directed to be cleansed by vinegar diluted with water, applied like the emollient liquid directed above.

The diet should be demulcent, and of the character recommended for simple stomatitis.

2. *Pseudomembranous Inflammation of the Mouth.*

Synon. Pseudomembranous Stomatitis, Diphtheritis buccalis; *Fr.* Stomatite Pseudomembraneuse ou Couenneuse, Diphthérite Buccale, Fégarite; *Ger.* Fegar, Mundfäule.

This can be regarded only as a severe variety of the last, affecting the same parts,—the exudation being detached in large flakes, having the ordinary appearance of false membranes. These are soon renewed, but in favourable cases, the inflammation, that gave rise to them, gradually disappears: in other cases, signs of gangrene supervene; this termination, however, and indeed the variety of the disease itself, is rare, except in large foundling establishments, where the mortality from it is at times frightful; of 193 cases, observed by M. Valleix, 153 terminated fatally. In such cases, a disagreeable sense of heat is experienced by the little sufferer, with pain augmented by the contact of foreign bodies; the breath is fetid, and the submaxillary glands enlarge and become painful. Later on, the lips and gums are tumid and bloody; a sanious saliva flows copiously from the open mouth; the breath becomes more and more fetid; and the face flushed and swollen. The fever is more or less intense, with headache, restlessness and want of sleep.

Treatment.—Where an impure air is connected with the origin of the disease, it is, of course, important that the patient should be removed from its influence. In the early period, the mucilaginous collutories, recommended in the last variety, may be used, with gentle laxatives of magnesia or castor oil. Afterwards, a mixture of muriatic acid and honey may be employed to touch the pseudomembranous

patches: this may be done by means of lint rolled around, or of sponge attached to, a small stick. Cullutories of chlorine water,[a] chlorinated lime,[b] creasote,[c] and vinegar and alcohol,[d] have likewise been recommended.

[a] R.—Mucilag. acaciæ gr. xij.
Aquæ chlorin.
Syrup. aā f℥ss.
Aquæ f℥iv.—M.

[b] R.—Calcis chlorin. gr. xv.
Mucilag. acaciæ f℥j.
Syrup. cort. aurant. f℥ss.—M.

[c] R.—Creasot. gtt. xv.
Mucil. acac. f℥jss.
Aq. camphor. f℥xss.—M.

[d] R.—Aceti f℥ij.
Alcohol. f℥iij.
Aquæ f℥iv.—M.

The application of muriatic acid, as well as of the other collutories, must be made once or twice, or oftener, in the twenty-four hours, as the case may require.

Alum,[a] nitrate of silver,[b] and sulphate of zinc,[c] have all been used as collutories, but they are not possessed of any advantages over the articles already mentioned.

[a] R.—Alumin. pulv. gr. xx.
Aquæ f℥iv.—M.

[b] R.—Argent. nitrat. gr. ij.—iv.
Aquæ f℥j.—Solve.

[c] R.—Zinci sulph. ℥ss.—℥j.
Aquæ f℥vj.—Fiat solutio.

c. *Follicular Inflammation of the Mouth.*

Synon.—Aphthous Stomatitis, Ulcerous Stomatitis, Aphthæ, Emphlysis Aphthæ, Follicular Stomatitis, Aphthæ Adultorum; *Fr.* Stomatite Aphtheuse ou Aphthes, S. folliculeuse seu ulcéreuse; *Ger.* Schwämmchen der Erwachsenen.

Much difference of sentiment has existed as to the precise nature of aphthæ. Some regard them as synonymous with stomatitis in general, and especially with the two last varieties; others, that they consist in an inflammation of the follicles of the mucous membrane of the mouth; others, that they are eruptive, and divisible into three species—the papular, the vesicular, and the pustular; and others, again, that they are entirely vesicular, and resemble the follicular ulcerations of the œsophagus and intestines.

Aphthous stomatitis may be either discrete or confluent. It attacks the parts especially where the epithelium is most apparent. In foundling hospitals, however, an ulcerous form of gastritis is occasionally seen, which strikingly resembles aphthous ulceration of the mouth. The whole of the internal surface of the stomach is studded with superficial, rounded, or oval-shaped ulcers, a line or two in diameter, having a yellow base, and slightly tumefied edges of a beautiful red colour.

The discrete form is not often met with in infants, but is common in children who have passed the first dentition, and in adults; and is often preceded by some degree of fever and signs of gastric derangement, which pass off in the course of a few days; hence it has been termed *ephemeral aphthæ*. The confluent form, which in consequence of its slow progress, has been termed *stationary*, is rarely confined to the mouth like the discrete, but extends to the fauces, and at times even to the infradiaphragmatic portion of the digestive tube. It is not common in the United States; but is said to be very often met

with in moist countries, as in Holland, where it reigns at times epidemically, and is a serious affection, attacking adults and childbed females especially. This form is accompanied by great cephalic, gastric, and general disturbance, and at times the eruption appears to extend to the intestinal canal, giving rise to severe pain in the abdomen, diarrhœa and typhoid symptoms, under which the patient may sink.

Pathological Characters.—When the mucous membrane of the mouth is inspected at an early period of the disease, it presents the appearances of simple stomatitis. Subsequently, when the eruption has occurred, small transparent, grayish or whitish vesicles are perceptible; and, at the base of each vesicle, there is a raised ring, which is resisting, and of a white colour. Still later, the vesicle breaks at the top, so as to allow the fluid to escape from it; after which it becomes transformed into an ulcer, which spreads, and is bounded by a red circle,—the raised border, that occupied or surrounded the base of the vesicle, gradually disappearing. The last stage is that of cicatrization, which occurs at times rapidly; the patient, who has suffered much one day from the soreness of the ulcers, finding himself entirely well on the next. A slight degree of redness may still remain, but it gradually disappears, and, whilst it exists, occasions little or no inconvenience.

Treatment.—The discrete form requires merely the treatment recommended in mild cases of diphtheritic stomatitis;—in the first instance, mucilaginous, and subsequently astringent, collutories. The confluent kind requires the antiphlogistic treatment, regulated according to the symptoms. Blood-letting is rarely needed: quiet in bed, the warm bath, emollient collutories, in the first instance, and subsequently the more astringent, should be directed. At times, the affection is manifestly asthenic, and requires the internal use of tonics, as the cold infusion of cinchona, and of the acidulous and astringent gargles referred to under the head of Pseudomembranous Stomatitis.

R.—Infus. cinchon. (sine calore præpar.) f℥vss.
Syrup. aurant. f℥ss.—M. Dose, a fourth part four times a day.

In such cases, and indeed in aphthous sores in general, touching the ulcerations with the nitrate of silver, sulphate of copper, or tincture of iodine, has been found by the author to be the most effectual remedy. The solution of persesquinitrate of iron, internally, has been highly extolled in cases of aphthous sores, by Dr. Adam, of Michigan.

R.—Liq. ferri persesquinit. gtt. xl.
Syrup. aurant. f℥ss.
Aquæ, f℥vss.—M.
Dose, a fourth part four times a day, to a child three or four years old.

At times, these aphthous ulcerations are extremely difficult of management, and very apt to recur after they have been healed. The author has observed some obstinate cases in women who were nursing,—the affection appearing to be induced by the constant drain from the mother interfering with her nutrition. Weaning the child has, in such cases, been indispensable. Attention has been directed of late, to this *Stomatitis* or *Sore Mouth of nursing women*, by Drs. Hale, Backus, Shanks, and Taylor. It would appear to prevail more in some parts

than in others, owing to causes that have not yet been appreciated. It is not, however, peculiar to this country.

In those who are affected with the obstinate forms, it is indispensable to change all the physical influences to which they are subjected: the thorough revulsion, induced by travelling air, and exercise, will often effect that beneficial change, which has resisted every remedy that could be thought of, whilst the patient remained under the same influences in which the malady had been engendered. When aphthous ulcerations have persisted for any length of time, they are to be regarded in the same light as other cases of faulty nutritive action of the dermoid tissue, and the same treatment strictly applies to them. The various eutrophics, as arsenic, iodine, sulphur, &c., are accordingly beneficial, either alone, or associated with the thorough revulsion recommended above.

The stomatitis induced by mercury—*mercurial stomatitis*—requires a similar treatment, (see Mercurial Ptyalism.)

d. *Gangrenous Inflammation of the Mouth.*

Synon. Gangrenous Stomatitis, Gangræna Oris, Stomacace Gangrænosa Infantum, Cancer Aquaticus, Noma, Cancrum Oris, Cheilocace, Ulocace, Cheilomalacia, Carbunculus Labiorum et Genarum, Stomatomalacia putrida, Stomatosepsis, Stomatonecrosis, Scorbutus Oris, Canker of the Mouth, Sloughing Soremouth of Children, Gangrenous Soremouth, Sloughing Phagedæna of the Mouth, Water Canker; *Fr.* Cancer aquatique, Stomatite Gangréneuse, S. Charbonneuse, Gangrène de la Bouche, Sphacèle de la Bouche, Fégarite, Aphthes gangréneuses; *Germ.* Wasserkrebs des Mundes, Mundkrebs, Lippenkinderbrand, Mundkinderbrand, Wangenkinderbrand, Sphacelose oder fressende Mundfäule, Fegar.

Many of the French writers have a division of gangrenous stomatitis; and it may be retained for the purpose of describing a scourge of our establishments for infants, which does not succeed to any well-characterized inflammation, and may perhaps be considered gangrenous *ab origine*;—the inflammation that may exist being secondary. It need scarcely be said that all forms of stomatitis, which have been described, may be followed by one form or other of gangrene; the ulcerations may become of a brown colour, and covered by a soft slough, which, when it is detached, leaves the surface beneath highly red and of a granulated aspect. The surrounding parts, in such cases are commonly much tumefied, and of a livid appearance, the breath at the same time having a gangrenous fœtor, and the saliva flowing more or less copiously from the mouth. The sloughing sometimes makes frightful progress, so that the cheeks and gums are occasionally destroyed by it before the little sufferer sinks. These symptoms have frequently been ascribed to mercury; but extensive and spreading ulcerations, with great fœtor oris occur where not a particle of mercury had been taken.

A terrific form of gangrenous stomatitis, which, as remarked above, is one of the scourges of establishments for infants, is that which is most commonly known under the unclassical name of cancrum oris.

Diagnosis.—The investigations of MM. Rilliet and Barthez lead them to infer that the disease always commences in the mucous membrane of the mouth; but they do not deny the possibility of its beginning in the tissues between the skin and mucous membrane, as is believed by Richter to be sometimes the case. The affection

does not always present the same symptoms. At times, on the inside of the lips or cheeks, small vesicles, of a grayish or livid red, or even black colour, appear, without much pain or swelling, but surrounded by a red base; preceded occasionally, or accompanied at their inception, by considerable fœtor oris and augmented secretion from the salivary glands. These speedily pass into a state of gangrene. The swelling, surrounding hardness, heat and pain increase; the vesicle sinks, and in its vicinity livid or black points are observed, which pass into extensive sloughs, surrounded by a glossy tumefaction; and spread so rapidly, that often, even in the course of two days, the lips, cheeks, nose, tongue, palate and tonsils, and even the whole face, become gangrenous, and slough off by piecemeal; the unprotected teeth falling at the same time from their sockets. At other times, the disease commences in the alveolar periosteum; but is first seen at the edges of the gums, opposite the incisors of the inferior jawbone; the gums present a white appearance at these points, become spongy and separated from the teeth, and the whole appearance is like that induced by mercury taken so as to affect the system. Ulceration now begins, and extends along the gums until the jaws are implicated; and, as the disease advances, the cheeks and lips begin to swell, and form a tense and indurated tumefaction; the gums are gradually destroyed by ulceration; the teeth become loose, and fall out; the gums and inside of the cheeks soon assume a gangrenous appearance, and the breath is insupportably fetid. The exterior of the cheek or the part where the tumefaction existed, now becomes of a purple colour, and vesicles often form from one-fourth of an inch to an inch in diameter, filled with dark-coloured fluid, which soon burst and discharge, and are speedily followed by the formation of sloughs. The discharge from the affected portions is often very acrid, and occasions excoriations of the unaffected parts with which it comes in contact. In the very early stages of the disease there is not much constitutional disturbance,—scarcely any fever or loss of appetite; the desire for food is indeed, at times great; but as the disease proceeds, and involves a greater extent of parts, irritative fever supervenes, the appetite is destroyed, colliquative diarrhœa sets in, and death closes the scene. Yet formidable as the disease always is, the deaths are not always in a very large proportion. In the year 1838, of twenty-three cases treated in the children's asylum of the Philadelphia Hospital, nineteen recovered, and four proved fatal. It would seem to be frequently complicated with pneumonia: M. Baudelocque, indeed, asserts, that the complication is invariably found to exist; and MM. Rilliet and Barthez met with it in every instance that came under their notice. At times, too, gangrene is found in other parts of the body,—in the lungs for example.

When the disease begins in the cheek it is described by many of the German writers under the name *Noma;* when in the alveoli, under that of *Stomacace.* The former is usually more malignant.

Causes.—The essential nature of this disease is unknown to us. It is strikingly analogous to that of gangrene of the lungs, hospital gangrene, and the *pustule maligne.* All these affections have been be-

lieved by some, indeed, to be identical. Among the predisposing causes must be reckoned the age of childhood; but infants at the breast are rarely affected by it. It is most frequently observed between the ages of twenty months and seven years. A great predisposing cause exists in the impure air and imperfect nourishment in large establishments for children. It is hence important, that all such establishments should have their windows constructed so that they can open to the floor; in any other form, perfect ventilation is impracticable; the unchanged and impure air stagnates beneath the window-sill, and must necessarily be breathed by the infants, whilst those of larger growth may not inhale it. The cachexia, thus induced, is extremely favourable to the production of the disease. In like manner, the state of the system that follows measles or scarlatina constitutes a predisposition. The most serious epidemics, which the author has observed, have supervened on the former disease. After smallpox, according to M. Taupin, it is rarely seen.

As the disease often occurs endemically in hospitals, attacking a great number of children about the same time, a question has arisen whether it be not propagable by contagion. Opinions have differed on this subject. It has been affirmed by Dr. Evanson, that when sloughing or gangrene is present in stomatitis, or a disposition to such is manifested, all agree upon the necessity of separating children not affected from those that are so. This will be proper, whether we regard the disease to be contagious or not. On the other hand, many of the best observers consider, that there is nothing to prove the contagiousness of the disease, and affirm, that it is usually observed in one patient at a time in an hospital, even when surrounded by other children.

Treatment.—From the nature of the disease, and the individuals that are generally affected by it, the proper treatment of gangrenous stomatitis will be ready appreciable. The great indications are to support the strength of the system, and to modify the condition of the gangrenous parts. The treatment will consequently resolve itself into first, the *internal*, and secondly, the *external*.

1. Tonics and antiseptics are here indicated. Of the former, the best, perhaps, is cinchona, and especially the salts of its active principle, quinia. As the subjects of gangrenous stomatitis are commonly young, these preparations have the advantage of being administrable, owing to their potency, in small quantities; and when they cannot be taken by the mouth, they may be given in enemata, or be sprinkled on the ulcerated surfaces.

℞.—Quiniæ sulphat. gr. viij.
Syrup. simpl. f℥iv.—M.
Dose, a dessert-spoonful every three hours to a child six years old.

Or, ℞.—Quiniæ sulph. gr. viiij.
Aq. chlorin. f ℥j. vel
Acid. sulph. dil. gtt. v.
Syrup. limon. f℥iv.—M. Dose, same as the last.

Chlorine water and chlorinated lime, or chlorinated soda, may also be administered with advantage.

℞.—Calcis chlorin. gr. x. vel
Liq. sodæ chlorin. gtt. viij.
Syrup. f℥ij.
Aquæ f℥iv.—M. Dose, same as the last.

The disease obviously consists in a morbid condition of the function of nutrition, and everything that modifies it can scarcely fail to be beneficial. Iodide of iron may, in this manner, serve a useful purpose.

℞.—Ferri iodid. f℥j.
Vini (sherry) f℥iv.—M. Dose, a teaspoonful, four times a day.

Chlorate of potassa has been highly extolled by Dr. Henry Hunt, in the quantity of from ℈j. to ℈ij., according to the age of the patient, in twelve hours. The beneficial influence of the salt, he says, is generally apparent within forty-eight hours, after its being first given; and it seldom fails to arrest the progress of the disease, and to effect a cure, if administered before the patient is very much exhausted. The author has had no experience with it.

A recent writer (*British and Foreign Medical Review*, July, 1847, p. 46) affirms, that he has found the nitrate of silver a very trustworthy remedy.

℞.—Argent. nitrat. gr. ½
Acid. nitric. dilut. ♏viii.
Aq. destillat. f℥j.—M.
Dose, a fourth part every four hours.

All these agents act as eutrophics, by modifying the condition of the blood in the vessels, and as the modified fluid circulates through the tissues that are in a pathological condition, it impresses their sensibilities in a different manner, and breaks in upon the morbid state, especially when aided by the agents that constitute the external treatment.

2. The great object in the external treatment is to arouse the living portions beneath the sloughs to action, and to promote the separation of the latter. When the cheek is observed to be tumid and hard, leeches and blisters have been applied, but without affording essential relief. The inflammation is, indeed, of the asthenic character, and will not bear depletion, although advantage might be presumed to follow the application of blisters, as in cases of erysipelatous inflammation. The best plan would appear to be to scarify the sloughs down to the diseased parts, and then to apply remedies that are appropriate for exciting a new action in the parts. These remedies belong to the class of excitants, and some of them act as powerful escharotics, and as antiseptics or disinfectants.

By some, it has been recommended, when a slight erosion is perceptible in the interior of the mouth, and a violet ecchymosis internally, to cauterize the central part of the swelling, either with butter of antimony, or with undiluted muriatic acid, introduced to the bottom of a crucial incision made on the outside of the cheek, or with the actual cautery, which is preferred by some. Dr. Baron recommends it as the sole means of restoration, and that it should be employed as early as possible to avoid extensive loss of parts. Others, however, are not favourable to its employment. In the epidemic in the Philadelphia Hospital, before alluded to, the author suggested the use of

creasote, applied after incisions had been made through the gangrenous parts.

℞.—Creasot.
Alcohol. āā f℥ss.—M.
To be applied by means of a pencil.

Simple sulphate of alumina,[a] potassa, in the form of the liquor potassæ, nitric acid,[b] pyroligneous acid,[c] chlorine,[d] chlorinated lime,[e] chlorinated soda,[f] and tincture of muriate of iron,[g] with or without incisions, nay be advised; but the caustics or excitants, which have met with most favour, have been sulphate of copper, and nitrate of silver used in the solid form, so as to produce an eschar over the whole of the sloughing parts.

[a] ℞.—Alumin. sulph. ℥ij.
Aquæ Oss.—f. lotio.
[b] ℞.—Acid. muriat. f℥iss. vel
Acid. nitric. f℥i.
Aquæ Oj.—f. lotio.
[c] ℞.—Acid. pyrolign. f℥ss.
Syrup. f℥i.
Aquæ f℥iv.—f. lotio.
[d] ℞.—Aq. chlorin.
Syrup. āā f℥ss.
Acaciæ pulv. gr. xij.
Aquæ f℥iv.—f. lotio.
[e] ℞.—Calcis chlorin. gr. xx.—xxx.
Mucilag. acaciæ f℥j.
Syrup. f℥ss.—f. collutorium.
[f] ℞.—Liq. sod. chlorin.
Aquæ, āā p. æ.—f. lotio.
[g] ℞.—Cupri sulph. ℥ij.
Cinchon. pulv. ℥ss.
Aquæ f℥iv.—M.
(*B. H. Coates*, of Philadelphia;) or, the bark may be omitted.

After each application of the caustics, MM. Bouneau, Rilliet and Barthez, and Taupin, advise that chlorinated lime should be applied by means of the finger moistened with water; and that this course should be adopted after the falling off of the sloughs. Whatever preparation is employed, it is well to make it come in contact, as far as is practicable, with the diseased tissues. The actual cautery has been suggested, and it would doubtless be an efficacious agent; but it can be capable of limited application only.

When sloughs have formed on the cheeks, the yest cataplasm, or poultices containing powdered bark, or chlorinated lime or chlorinated soda, or pyroligneous acid, may be applied to the part previously washed with any of the lotions already mentioned. Should diarrhœa supervene, it may be treated by a small dose of castor oil and laudanum, in the first instance, and subsequently by starch and laudanum glysters, to which sulphate of quinia may be added, if esteemed advisable.

℞.—Ol. ricin. f℥j.
Tinct. opii, gtt. ij.—M.

The diet throughout the disease, should be nutritious, consisting of beef tea, beef essence, wine whey, the farinaceous vegetable preparations, as arrow-root, sago, and tapioca to which wine has been added in quantities suitable to the condition of the patient; and it need scarcely be said, that where practicable the child should be removed from the atmosphere in which the disease was generated.

II. HEMORRHAGE FROM THE MOUTH.

Synon. Hæmorrhagia Oris, Stomatorrhagia, Stomorrhagia, Stomatosis; *Fr.* Stomatorrhagie; *Ger.* Blutfluss aus dem Munde, Mundblutfluss.

The word Stomatorrhagia was introduced by J. Frank to signify hemorrhage from some part of the mouth—as from the inner surface of the cheeks or lips, the gums, velum palati, pillars of the fauces, uvula, tongue, and even from the fauces,—and in this sense it is employed at the present day.

It is rarely a primary affection; but is almost always symptomatic of an altered condition of the blood, as in scorbutus; of a spongy condition of the gum, or of injury done to the mucous membrane of the mouth. It may, also, be caused by the extraction of a tooth, and by carcinoma of the tongue. Generally, it is an affection of no consequence; but in scorbutus, and when induced by either of the two last mentioned causes, it may be alarming, and even fatal. When the blood is exhaled from the mucous membrane of the fauces, it may pass down the pharynx and be swallowed, especially when the patient is in bed, and lies on his back; and should it accumulate in any quantity in the stomach and bowels, it may cause vomiting, or be passed off by the bowels. Commonly, however, by washing the mouth with a little warm water, the part whence the hemorrhage proceeds may be detected. The blood, which flows from the mucous membrane of the mouth, is generally of a dark colour, not frothy, and it is not intimately mixed with the salivary or other secretions.

Treatment.—Cold and astringent washes should be employed; and if a vessel has been exposed by ulceration, the solid nitrate of silver or the actual cautery may be needed. Where the hemorrhage occurs from an alveolus, after a tooth has been extracted, pressure may be made, or powdered burnt alum or creosote may be introduced into the alveolus, and at times it may be necessary to employ the actual cautery.

SECTION I.

DISEASES OF THE TONGUE.

The condition of the tongue is an important index in disease. It shows the degree in which the function of secretion elsewhere is modified, is indicative of morbid conditions of the lining membrane of the alimentary canal at a distance from it, and of the extent of general disorder; and in some diseases, as in scarlatina, presents appearances that are peculiar. Its state of moisture or dryness has likewise to be noted in disease. It may, however, become unusually dry under the influence of nervous agitation;—one of the circumstances, which exhibit, that although we may regard the process of secretion to be carried on independently of the nervous influence, such influence is capable of modifying it in some degree. In the case of the secretion from the lachrymal gland, we have an example in which

the secretion is augmented under mental emotion. These, however, are symptomatic conditions. The idiopathic affections of the organ alone concern us here.

I. INFLAMMATION OF THE TONGUE.

Synon. Glossitis, Inflammatio Linguæ, Glossoncus Inflammatorius, Angina Linguaria; *Fr.* Glossite, Inflammation de la Langue; *Ger.* Zungenentzündung.

Inflammation of the tongue may be superficial or deep-seated. The former, as affecting the mucous membrane, has been considered under stomatitis. The latter is a different affection.

Diagnosis.—The tongue is observed to be painful, hot, red, and swollen; and, when attempts are made to move it, the pain becomes excessive. At first, the affection may be limited to a part, and a small part of the organ; but gradually it extends; the pain becomes acute, lancinating, and burning; and the smallest contact of a resisting body is almost insupportable; deglutition, articulation, and, in short, every muscular motion in which it is implicated, excite the most excruciating torment. At times, the tongue is so enormously swollen as to threaten suffocation, and to hang out of the mouth; and, occasionally, by the pressure of the teeth, indentations are made, and livid or black appearances presented on the protruded part, which threaten mortification. Whilst the tongue is in this condition, and covered frequently with a thick fur, saliva flows copiously from the mouth; and, during the existence of the phlegmasia, the general symptoms are such as are present in all forms of inflammation, and are proportionate to its severity. A tumour is sometimes met with on the upper surface of the tongue, which is at first hard, and slightly painful on pressure; this suppurates slowly, and afterwards forms a deep ulcer. At other times, the tongue presents a diphtheritic appearance, under which ulcers form, which may even perforate it. The edges of the tongue may be ulcerated, owing to the pressure of sharp spicula of teeth. The sores are tender, and surrounded with a hard base, and may be considered as belonging to stomatitis. They do not, at least, require any separate management.

Causes.—These are usually acrid substances taken into the mouth, or injuries inflicted by the teeth, or by external bodies. It is one of the results of the ptyalism induced by mercury; and the most alarming cases, which the author has ever seen, occurred in this manner. It is met with also in the course of smallpox and scarlet fever, and exists not unfrequently in severe cases of isthmitis and amygdalitis.

Pathological Characters.—These may be gathered from the detail of the symptoms. The great tumefaction is owing to the infiltration of serum; but at times coagulable lymph is thrown out, which accounts for the circumscribed hardness.

Treatment.—Superficial glossitis is rarely a disease of any consequence, and yields to the use of the washes recommended under simple, or diphtheritic stomatitis. The deeper-seated form is a cause of some anxiety. Generally, it terminates rapidly by resolution, rarely by suppuration, and still more rarely by gangrene and death. In this form, when accompanied by much swelling, general bleeding may be

needed; leeches may, likewise, be applied to the under surface of the tongue, and scarification be made on the upper surface. The last measure affords great relief, by discharging not only the blood contained in the hyperæmic vessels, but the serous fluid effused into the cellular membrane. Relief may also be obtained from the application of ice to the surface of the tongue, and of a blister to the throat and neck.

Occasionally, the tongue, on one or more parts, has the appearance of gangrene, constituting the affection termed, by some *glossanthrax*. In these cases, it has been advised to apply the actual cautery to the mortified portion, and to make use of the collutories of chlorinated lime or soda, or the other excitant and antiseptic washes, described under gangrenous stomatitis.

In all forms of glossitis, revulsion, by means of active cathartics, or cathartic enemata, may be attempted; and, if the swelling be so great, that the tongue is protruded from the mouth, and pressed upon by the teeth, the organ may be enveloped in a cloth, and be pressed firmly for some time, so as to force the effused fluid into the cellular membrane of its posterior part; and, when once the organ has been returned into the interior of the mouth, it may be retained there by means of a piece of gauze fastened firmly over the outlet, which will enable the patient to breathe without difficulty. The author knew a case of excessive infiltration of the tongue accompanying mercurial ptyalism, which was treated successfully by this method. If, owing to the excessive tumefaction of the tongue, suffocation should be threatened, the organ should be scarified deeply in the direction of its length, and, if the imminent symptoms still persist, tracheotomy or laryngotomy may be needed. In the cases in which a hard tumour forms, that suppurates slowly, and leaves a deep ulceration, the revulsive treatment by emetics and purgatives, aided by the local application of the solid nitrate of silver, may be entirely successful.

Where the surface of the tongue is covered by a dry, white pellicle, and is ulcerated or perforated—a condition which has been described, by Dr. Marshall Hall, as psoriasis—it is necessary, as in cutaneous affections in general, to act on the general system. This can be done by agents that modify the system of nutrition, of which arsenic,[a] and iodine,[b] are among the best, especially, if given in simple syrup, which, of itself, is capable of modifying the chyle, and, through the blood, the nutrition of the tissues. At the same time, nitrate of silver may be applied to the tongue itself.

[a] R.—Liq. potass. arsenit. gtt. xxiv.
Syrup. simpl. f℥ivss.—M.
Dose, one-third, three times a day.

or, R.—Acid. arsenios. gr. ij.
Micæ panis ℈ij. f. massa in pil. xij. dividend.
Dose, one, three times a day.

[b] R.—Liq. iodin. comp. (*Lugol,*) gtt. xxx.
Syrup. f℥iiss.—M.
Dose, one-third, three times a day.

The ulcerations, that are occasioned by any sharp projection of the teeth usually heal readily, without any medication, if the irritating body be withdrawn.

Glossitis does not often pass into the chronic state, but cancer of the tongue may supervene in persons of the cancerous diathesis; and hypertrophy of the organ, which requires a surgical operation, has been observed among its consequences. These hypertrophies appear to assume, at times, the characters of the erectile tissues. At others, the fleshy fibres of the tongue are found, on dissection, to have been converted into a substance of a semi-cartilaginous nature, leaving scarcely a trace of the primitive structure.

II. CANCER OF THE TONGUE.

Synon. Cancer Linguæ; *Fr.* Cancer de la Langue; *Ger.* Zungenkrebs.

This is not a common disease. It is generally situate near the tip of the organ, and sometimes at the edge.

Diagnosis.—When inflammation has not preceded it, tumefaction and induration are the first symptoms; after which, painful shootings are experienced, which augment as the disease makes progress. The movements of the tongue become difficult and painful, as well as the associated actions of mastication and deglutition. At length, the indurated tissue passes to a state of ulceration; the ulcers are irregular, red, and hard, and generally with everted edges; and a sanious, bloody matter, of great fœtor, flows from the mouth, along with an increased secretion of saliva. The sufferings, as in other cases of cancer, become insupportable, and the unfortunate subject is worn out by the irritative fever that accompanies it in its latter stages.

Causes.—In all cases, there must be a diathesis, which predisposes to cancer; and, when this exists, any injury done to the tongue may act as an exciting cause.

Treatment.—In the early period, attempts may be made to modify the diathesis by agents which induce a new action in the system of nutrition—as by the internal use of the preparations of arsenic, or iodine given in syrup; but if these agents, accompanied by rest of the organ, produce no change, the only remedy is extirpation of the part affected, which, as it is generally seated near the tip of the tongue, can be accomplished without much difficulty.

SECTION II.

DISEASES OF THE TEETH.

I. DENTITION.

Synon. Dentitio, Odontia Dentitionis, Odontiasis, Odontalgia Dentitionis, Odaxismus, Teething; *Fr.* Dentition; *Ger.* Zahnen.

The process of cutting the teeth, it need scarcely be said, is natural, and not to be classed among pathological conditions; yet, at this period of the infant's life, the system is so impressible, and the irritation induced by the pressure of the teeth on the nerves of the gum so great, that the attention of the physician is frequently called to it.

Certain symptoms are, to a greater or less degree, universal concomitants of dentition. These are—pain, swelling, and heat of the

gums, on which the teeth are pressing; constant flow of saliva, with a desire to bite objects—unless the gums are very painful, when they are carefully avoided, or, if introduced into the mouth, are speedily withdrawn. The child is, at the same time, restless aad fretful: the sleep is disturbed, and the digestive organs are often more or less deranged. These symptoms are so generally present, that, in moderation, they can hardly be looked upon as constituting disease; but, where the nervous system is unusually impressible, the irritation from the teeth irradiates to the great nervous centres, and convulsions are the occasional consequences.

It is important to attend to the state of the gums, whenever any diseased condition occurs simultaneously with dentition; yet there can be no doubt, that many affections are ascribed to it, which are mere concomitants.

The local condition will alone fall under consideration here. The affections that are induced by teething will be examined in their appropriate places.

Treatment.—It has been a question, whether, during the irritation of teething, when the child is desirous of conveying everything to the mouth, hard substances should be permitted to press upon the gums. It is a common custom to allow the child the use of a piece of coral, or of sealing-wax, or, what is preferable—inasmuch as it cannot be forced into the mouth and injure the soft parts of that cavity—an ivory ring. Some of the French writers discard all such substances, but without much propriety. If the gums be very tender, the child will not use them; and, if pressing the gums upon them should afford relief, there appears to be no good reason, why their use should be forbidden, as the pressure cannot fail to aid the absorption of the gum. It has been suggested, as a good plan, to allow the child the use of a small wax candle, a stick of liquorice root, or a crust of bread. The first of these may be unobjectionable; but the liquorice root may load the stomach with mucilaginous saccharine matter, if allowed too freely; and the crust of bread may excite alarm, by the softened portions getting into the glottis, and producing symptoms of strangling. The physician, however, is not often consulted on these points; the whole matter being generally regulated by the parent or nurse.

Where the gums are swollen, tense, and very tender—and especially if there be, at the same time, a morbid condition, which appears to be connected with the process—it may be necessary to relieve the hyperæmia, either by scarifying the tumefied gum freely, or by dividing it down to the tooth, until we distinctly hear or feel the tooth grating against the instrument. The restraint under which the infant is placed during the operation generally occasions it to cry, which is often ascribed to the pain of the operation. This is a mistake. It rarely happens, that much pain is experienced, and very frequently the child bites the lancet, as if the sensation were agreeable to it.

The tooth appears, at times, soon after the operation; but, in many cases, it is long before it presents itself. In the latter category, it has been conceived, that mischief may result from the induration of the cicatrix, which, it is imagined, may retard the exit of the tooth. This

is not so It is well known, that, where absorption takes place upon parts on which there are cicatrices, the cicatrices are more readily taken up than the parts surrounding them.

Free division of the gums is an admirable remedy in the cases above referred to, and the operation may be repeated again and again should circumstances arise to indicate it.

II. TOOTHACHE.

Synon. Odontalgia, Odontia Dolorosa, Dolor Dentium; *Fr.* Odontalgie, Douleur des Dents; *Ger.* Zahnschmerz, Zahnweh.

This disease is characterized essentially by acute pain in the teeth or their involucres, and is dependent upon various pathological conditions, which may require a brief and distinct consideration.

a. *Inflammation of the Alveolo-Dental Membrane.*

Synon. Periodontitis; *Fr.* Périodontite, Inflammation de la Membrane Alvéolo-dentaire.

The membrane that lines the socket of the tooth is, at times, attacked with inflammation, giving rise to much suffering.

Diagnosis.—An uneasy feeling in the alveolus, or alveoli, of some part of the jaws when the teeth are pressed together; the teeth of the affected periosteum being evidently slightly forced outwards, so that they cannot be accurately brought in contact. This painful sensation, pulsative and constant, may exist for a few days, and then pass off; but, at other times, the inflammation spreads outwards, so as to be perceptible on the gums; the teeth become loose; and, at times, pus is secreted in the alveolus, which makes its way outwards, between the gum and the tooth. In other cases, the parietes of the alveolus become carious, and a fistulous ulcer is kept up. When the inflammation has recurred frequently, the tooth may become permanently loose, and act as a foreign body in the socket.

Causes.—Periodontitis may be induced by caries of the fang, which is not often, however, the first cause. Cold and hot fluids taken into the mouth, and partial exposure to cold and moisture, have been looked upon as exciting causes; but, as in every other form of inflammation, the precise etiology is by no means clear.

Treatment.—The affection generally terminates by resolution; but, should the excitement be great, and the pain excessive, it may be necessary to apply leeches externally, to scarify the gums in the vicinity, and to give a full dose of opium, or of some of its preparations. If the tooth be loose, and no chance exist of its becoming fixed, and the maintenance or recurrence of the disease be owing to this circumstance, it will be advisable to extract it.

Periodontitis, followed by secretion of morbid matter, is a very common cause of the loss of teeth. Occasionally, it appears to be connected with some constitutional *vice*, when it has to be met by constitutional remedies. Dr. Graves gives the case of a gentleman, who had been affected by rheumatic periostitis, which was relieved by the internal use of iodide of potassium. Subsequently, he suffered greatly and repeatedly from periodontitis, which resisted every remedy, until the iodide of potassium was used, which completely removed it.

b. *Inflammation of the Dental Membrane.*

Synon. Endodontitis, Odontitis, Inflammation of the Lining Membrane of the Tooth; *Fr.* Odontite, Inflammation de la Pulpe Dentaire.

The membrane that lines the dental cavity may likewise be inflamed: but it is not easy to distinguish this from toothache dependent upon erethism of the nerve. It may be suspected, if no signs of caries be observed on examination; but it cannot be accurately diagnosticated. The same intermission in the pain—the same absence of inflammation of the gum—occurs in the early stages: but, afterwards, the pain may become more constant.

Treatment.—If endodontitis is believed to exist, the same plan of treatment may be adopted as in periodontitis.

c. *Caries of the Teeth.*

Synon. Caries Dentium, Odontalgia Cariosa; *Fr.* Carie des Dents; *Ger.* Beinfrass der Zähne.

This is one of the most common diseases of the teeth, and occurs in some countries more than in others. The traveller, in certain parts of the south of France and of the southern regions of this country, is struck with the ravages of dental caries, whilst, in other districts, the inhabitants are equally characterized by the excellence of their teeth.

Diagnosis.—Pain experienced when hot or cold liquids are received into the mouth, or the supervention of the ordinary signs of toothache, attracts the attention of the patient to the condition of the teeth, and careful examination exhibits, that there is either a cavity opening externally in some part of the tooth or teeth affected, or that an internal process of decay has been established, which leaves but a shell of bone between the cavity of the tooth and the open air, so that the dental nerves are readily affected through it by external agents. The precise part at which the caries or gangrene takes place varies. It is usually considered to commence immediately beneath the enamel, in the osseous substance of the corona of the tooth. A small, dark spot is observed, which gradually spreads, until there is a free communication between the external air and the dental cavity. In this mode, the whole of the corona may be destroyed—the fangs alone remaining, and often continuing to excite periodontitis, as extraneous bodies, until they are removed by the punch of the dentist. At other times, the gum closes over them, and they no longer excite irritation. The disease is seated in the system of nutrition of the tooth, and has been presumed, by some, to consist originally in inflammation.

Causes.—It is a common belief, that dental gangrene is universally owing to the action of external agents upon the teeth, and the idea has been maintained for various reasons: in the first place, it gives the dentist an opportunity to form "innoxious" dentifrices, which he can recommend to his customers; and, in the second place, it is often convenient to the parent to hold up the idea to her child as a bugbear, when its desire for sweets and other objectionable articles is inordinate.

The facts, already mentioned, that dental caries is more common

in some regions than in others—that it is an evil affecting families in many cases—and that the caries is observed, first of all, beneath the enamel—would, of themselves, make us pause in admitting this belief. There is, moreover, a greater liability to the disease in some teeth than in others. The last molar tooth but one, and generally of the upper jaw, is most usually the first affected; and, after it, the corresponding tooth of the opposite side suffers, owing to their being situate anatomically alike, and, consequently, the immediate cause of caries, after having acted upon the one, will be more likely to affect the other. Often, too, the next tooth to the one that is carious becomes so likewise, and on the side nearest to the diseased portion of the first. This has been supposed to be owing to contagion, but there is no good reason for admitting it. Next to the corresponding tooth of the opposite jaw, the one in immediate proximity with the tooth primarily affected, must be most likely to be implicated, seeing that its anatomical elements—blood-vessels and nerves—can vary but little from those of its neighbour.

The upper incisors are often decayed, and, in unhealthy children, caries sometimes attacks almost the whole of the teeth of the first dentition. It is impossible to depict the kind of dyscrasy which predisposes to the affection. Some have imagined, that those of a tuberculous constitution are more subject to it; but we often see the teeth largely decayed in persons who are neither tuberculous nor strumous.

The prevalent belief is, that acids are very destructive to the teeth, and, therefore, a common cause of caries. But destruction of the enamel does not necessarily give occasion to caries. We have seen many cases in which portions of the incisors have been broken off, yet decay has not supervened, unless the individual was predisposed to it; and the dentist is in the daily habit of filing away the enamel, under the conviction, derived from experience, that caries will not necessarily, or be likely to follow. In certain cases, too, the enamel, in the progress of life, scales off by what John Hunter called "the denuding process;" yet decay does not necessarily result. It would seem consequently, to be improbable, that any agent, which acts chemically upon the enamel, could induce caries, when the removal of the enamel, by the file of the dentist or by mechanical injury, does not occasion it. Besides, it is not easy to conceive how any acid substance, having a greater affinity for the lime of the tooth than the phosphoric acid,—and there are not many such,—could remain in contact with the tooth in a state sufficiently concentrated to exert any chemical agency upon it. The presence of acid in the mouth always augments the secretion from the salivary glands, so that it becomes speedily diluted.

If such be the case with acids, how unlikely is it, that the free use of sugar should be directly injurious to the teeth! In sugar there is no acid, yet it has been imagined, that a chemical action may be exerted upon the teeth by indulgence in it. This—as before remarked—is a bugbear, which has doubtless been created, in the first instance, with the view of deterring children from the use of a substance of which they are fond, and the indulgence in which is objectionable for

sumptuary and other reasons. It has, indeed, been observed, that the negroes in the West India Islands, who drink the juice of the cane very freely, have unusually good teeth, and we know that the nutrition of the frame improves under its use. There cannot be a doubt, therefore, that external agents of a chemical nature are not as much concerned in the production of dental gangrene as is generally admitted; but we can easily comprehend, that, in one who is predisposed to the affection, substances that disagreeably impress the nerves of the fifth pair in the mouth—as hot or very cold liquids—may act as exciting causes, by modifying the nutrition of the teeth, and producing the condition in question.

Treatment.—The readiest method of cure, when caries is discovered in a tooth, is to plug up the hole, where this is practicable, with a metallic or other substance. But this is only admissible when the caries communicates externally, and when the cavity in the tooth is greater than the aperture. Caoutchouc has been highly extolled for this purpose. A piece of it is to be put on a wire, melted at the flame of a candle; and pressed, whilst warm, into the hollow tooth. The cavity of the tooth should be first cleansed with a piece of cotton. In consequence of the viscosity and adhesiveness of the caoutchouc, the air is completely prevented from coming into contact with the denuded nerve.

Where plugging is impracticable, relief may be obtained by destroying the affected nerves either by the actual cautery, or by caustics —as chloride of zinc in the liquid state—introduced into the cavity,— care being taken not to implicate the surrounding soft parts.

The pain may be palliated by substances that deaden the sensibility of the dental nerves, as the different preparations of opium; essential oils, as of cloves; mustard, alcoholic liquors, &c. One or two drops of hydrocyanic acid, put into the hollow tooth, have assuaged the pain; but it need scarcely be said, that so potent a remedy should be employed with caution. Pyroligneous acid has been used, in the same cases, dropped on cotton; and, of late years, its main energetic principle, creasote, has been more extolled, perhaps, than any other remedy. When creasote is applied in the same manner as the agents above mentioned, or by means of a pencil imbued with it, it causes instantaneously acute pain and a considerable secretion of saliva. The patient is often relieved, but the pain generally recurs, and perhaps the advantage derived from its use is not greater than that from the stronger essential oils. Creasote may be reduced by the addition of an equal quantity of alcohol. It is the opinion, however, of Dr. Cormack and others, that although it affords respite from pain, it hastens the destruction of the teeth. Tincture of chloride of iron, and solution of persesquinitrate of iron, have also assuaged the pain, and Dr. Wright speaks in exalted terms of the oil of ergot, which he has repeatedly known to subdue the pain when creasote had failed.

Mr. Druitt has recommended the use of tannin in toothache, the efficacy of which, he states, he has tested by ample personal experience. It will be often found, he remarks, that the gum around a carious tooth is in a spongy, flabby condition,—a small piece of it, perhaps, grown

into the cavity. The ache, too, he affirms, is often quite as much in the gum as in the tooth itself. "But be this as it may, when the tooth aches, let the patient wash out the mouth thoroughly with a solution of carbonate of soda in warm water; let the gum around the tooth, or between it and its neighbours, be scarified with a fine lancet—then let a little bit of cotton wool, imbued with a solution of a scruple of tannin, and five grains of mastich in two drachms of ether, be put into the cavity; and if the ache is to be cured at all, this plan will put an end to it in nine cases out of ten."

Revellents, which act on other nervous ramifications than those implicated, often afford relief even in dental caries, although they would seem to be more advantageous in the neuralgic form. Hence, the chewing of tobacco to one unaccustomed to it; of pepper, pyrethrum, ginger, the bark of aralia spinosa, (*angelica tree*, or *toothache tree*, of the United States,) horseradish, calamus, mezereon, or any agent, in short, which belongs to the class of local sialagogues, may yield relief. A union of narcotics and sialagogues has been proposed, and highly extolled by Rust.

℞.—Extract belladon.
——— hyoscyam.
Opii aā gr. v.
Pyrethr. pulv. gr. x.
Ol. caryophyll. gtt. v.—M.

To be made into one-grain pills, sprinkled with powdered pyrethrum, and kept in a stopper bottle. One of these to be put into the carious tooth.

Where the decay is extensive, and the pain cannot be controlled by any of these agents, the tooth will have to be extracted.

d. *Nervous Toothache.*

Synon. Odontalgia Nervosa, Neuralgia Dentalis; *Fr.* Odontalgie Nerveuse; *Ger.* Nervöse Zahnschmerz.

Under this term many writers describe *neuralgia of the teeth*, which may be mistaken for ordinary toothache from caries, but may generally be distinguished from it by the history of the case, as well as by the pain being more periodical, and shooting with the utmost violence along the branches of the fifth pair distributed to the affected jaw.

Treatment.—For the treatment of this form of neuralgia, the general rules, laid down under the head of Neuralgia, will be appropriate. The reliance of the practitioner has to be placed upon narcotics in large doses, administered internally, and applied locally—and upon revellents, as blisters behind the ear. In rheumatic odontalgia, which may be regarded as a variety of nervous odontalgia, the insertion of a little cotton, imbued with creasote, in the ear of the same side, has been found serviceable. A tincture of *spilanthus oleraceus* has been much recommended in France and Germany, as a secret remedy, in toothache, and it is only of late that its composition has been known.[a]

[a] Take of the leaves and blossoms of *Inula bifrons*, one part; blossoms of *Spilanthus oleraceus*, four parts; roots of *Anthemis pyrethrum*, one part; *Alcohol*, s. g. ·863, eight parts. Digest for a fortnight, and filter.

Its virtues are probably dependent upon its acting like the sialagogues before mentioned; all of which, by the way, are indicated in

nervous odontalgia. The tincture of spilanthus is said to relieve toothache instantaneously, when applied to the gums and teeth. By others, it has been esteemed very uncertain.

The various stimulating liniments, the milder counter-irritant lotion of Granville,[a] and sinapisms, have been used with advantage, applied over the cheek or behind the ears; and the more rapid the revulsion, the more effective it is in general. It is in such cases, too, that the efforts of the animal magnetizer and the Perkinist, and the employment of the mineral magnet, may be expected to prove beneficial.

[a] R.—Liq. ammon. fortior. f℥j.
Sp. rosmarin. f℥vi.
Tinct. camphor. f℥ij.
A piece of thick coarse flannel to be impregnated with the lotion, and pressed on the part for a few minutes.

To this division of toothache belongs that of the pregnant female, which may, likewise, be relieved by the agents just indicated. It cannot often be necessary to extract the tooth, an operation which should always be avoided, where practicable, for fear the shock may induce abortion.

e. *Exostosis of the Teeth.*

Synon. Exostosis Dentium; *Fr.* Exostose des Dents.

Like the bony structures elsewhere, the teeth are liable to exostosis. The deposition usually occurs in the fangs, but scarcely admits of detection. Violent, deep-seated pain, not relieved by the ordinary methods, induces the patient to have the tooth extracted, when the affection is, for the first time, apparent.

f. *Tartar of the Teeth.*

Synon. Odontolithus, Tartarus Dentium, Odontia Incrustans; *Fr.* Tartre des Dents; *Ger.* Zahnstein.

From the saliva, a calcareous matter is deposited, which concretes around the base of the coronæ of the teeth, and, at times, where due attention is not paid, accumulates in considerable quantities, causing the gums to inflame, and to be absorbed, so that the support afforded by them to the teeth is lost. The main constituent of these concretions is phosphate of lime, which is cemented by means of animal matter. It has, indeed, been affirmed by M. Mandl—as the result of his microscopic observations—that they are formed of calcareous skeletons of infusoria, agglutinated by means of dried mucus.

When first deposited, the *tartar*—for so it is termed—is soft, of a yellowish colour, and easily removable; but, as it hardens, the colour becomes of a dark brown or black, and is extremely unsightly. When it accumulates in any quantity, it is impossible to cleanse the mouth properly, so that the secretions are retained there, and, at the temperature of the mouth, 98°, readily undergo decomposition, so as to taint the breath.

Treatment.—Attention to cleanliness, by the daily use of the toothbrush, will prevent the formation of this concretion. The brush itself may be sufficient, but any of the ordinary dentifrices may be used along with it. There is no better "tooth powder" than a mixture of

powdered charcoal and powdered orris root;[a] but there is no end to the dentifrices that have been recommended.

[a] R.—Carbon. ligni pulv. part. iij.
Irid. Florent. pulv. part i.—M.

Each dentist—nay, each druggist—has his own, which is, of course, extolled by him as the best; and none are, perhaps, positively injurious. It may be well, however, to bear in mind, that the reiterated friction of a hard brush, employed daily and for years, may have some effect, of itself, in injuring the teeth; and, therefore, that the brush should be used no longer at a time, and with no more force than is necessary for the removal of the secretions. Where the tartar has already formed, and does not yield to simple friction of the kind advised, dilute acids—which, as has been already observed, are objected to by the dentist, but without sufficient reason—may be employed. Weak sulphuric acid will usually remove the concretions without much difficulty; but, should it fail, the services of the dentist are demanded to scale the teeth; after which, the re-formation of the tartar may be prevented by the tooth-brush and dentifrices.

SECTION III.

DISEASES OF THE GUMS.

Under Stomatitis, the inflammatory affections of the mucous membrane, investing every part of the mouth, were included. The substance of the gum is, however, liable to affections which require special consideration.

I. INFLAMMATION OF THE GUMS.

Synon. Ulitis, Inflammatio Gingivæ; *Fr.* Ulite, Gengivite, Inflammation des Geneives; *Ger.* Entzündung des Zahnfleisches, Zahnfleischentzündung.

Inflammation of the gum is a common occurrence, and is denoted by pain, heat, throbbing, tumefaction, and redness in some part of the alveolar coverings. In a state of health, the gum is not possessed of much sensibility; but when inflamed, like many other structures, it becomes highly painful. At times, the inflammation terminates by resolution, but very frequently it passes on to suppuration, constituting *Gum Boil*; (*Parulis*, *Phlegmone Parulis*, *Apostema Parulis*; Fr. *Parulie*; Ger. *Zahnfleischgeschwulst.*) The formation of pus takes place most rapidly in this structure.

Causes.—As in other inflammations, the causes of ulitis are not often apparent. At times, however, the constant formation of abscesses is owing to some morbid condition of the alveolus; a carious tooth inflames the lining membrane of the socket; pus is secreted; ulcerative absorption takes place, and the abscess gradually makes its way to the surface of the gum. In this case it is sometimes termed *alveolar abscess.* In particular conditions of the general system, when neither the teeth nor the alveoli appear to be in fault, abscesses frequently form in the gums, which are not attended with any other inconvenience than

that which results during their presence. After a time, and under some new evolution of the system, this tendency disappears.

Treatment.—Scarifying the gums, in the early stages, is one of the best remedies. A leech or two applied to the inflamed part also frequently arrest the inflammation. If suppuration be likely to result, it may be encouraged by the application of any substance, which will retain heat, and be at the same time moist. A roasted fig answers the purpose. Yet it may be questioned, whether, in the ordinary moist condition of the mouth, and at a temperature of 98°, the parts may not be in as favourable a condition for the production of suppuration, without the use of "suppuratives," as with them.

When pus has unequivocally formed, it is well to open the abscess, provided it exhibits any disposition to spread; but, usually, it is left to itself, breaks, and discharges its contents, without the supervention of any mischief.

If the recurrence of the abscesses be owing to the presence of a carious tooth, or to sources of irritation in the alveolus, these must be removed where practicable.

Should ulceration of the gums remain, excitant applications, like those described under the next head, may be had recourse to.

II. EXCRESCENCE OF THE GUMS.

Synon. Excrescentia Gingivæ, Epulis, Uloncus, Odontia Excrescens, Sarcoma Epulis; *Fr.* Epulie; *Ger.* Auswuchs am Zahnfleische.

The gums occasionally become hypertrophied, and so exuberant as almost to cover some of the molares, passing behind the upper incisors, so as to interfere materially with the closure of the jaws. Frequently, the hypertrophied portions rise into distinct hard projections having the general characters of the gums themselves.

The cure consists in removing them by the knife, ligature, or caustic. Being supplied, however, with blood-vessels of considerable size, their removal by excision often occasions considerable hemorrhage; and, on this account, recourse has been more frequently had to the latter means. The protuberances, when removed, are apt to return. They have been reproduced six times in succession.

Occasionally the gums—especially those at the buccal side of the superior incisors—are attacked with hyperæmia and some degree of inflammation, but no tendency to suppuration, as in the case of ulitis before described. In this condition, they may remain for a few days, preventing the jaws from being closed, and exciting more or less uneasiness. It has been suggested by Dr. Marshall Hall, that the tumidity of the gums, which consists in their growing up in front between the teeth, and in the posterior part of the mouth, so as to cover some of the molares, is usually induced by a loaded state of the colon: but it is not easy to see the relation between the two morbid conditions.

If the digestive function be deranged, mild aperients and tonics may be prescribed with advantage; and nothing better can be given than a combination of charcoal and magnesia.

℞.—Magnes. gr. v.
Carbon. ligni pulv.—gr. xv. f. pulvis.
Dose, one, three times a day.

Scarification, early employed, is also of essential benefit; and, if the protuberance become permanent, it will have to be removed by the means already mentioned.

Another form of *uloncus* is the fungous or spongy condition, which has been commonly termed *scurvy of the gums.* This is a concomitant of scorbutus; but it occurs in conditions of the digestive organs of various kinds, especially in such as are of an atonic character. At other times, it seems to be entirely local, from causes seated in the gums themselves, or in the teeth or alveoli. The gums exhibit a soft, protuberant, or spongy appearance, and bleed on the slightest touch.

Treatment.—In simple sponginess of the gums, in which their texture is lax, and their nutrition consequently executed imperfectly, simple division of the gums on many parts of their surface, with the shoulder of a lancet, is one of the best remedies. The hyperæmia of the capillary vessels is in this manner removed, and the new action, thus induced, itself leads to a cure. Where the affection is to a less extent, friction with a hard brush, where the gums will bear it, may be advisable; and, in both cases, the use of excitant collutories, or pastes, especially after scarification, will be advisable.

℞.—Tinct. myrrh. f℥ss.
——— cinchon. f℥j.—M.
Or, ℞.—Ferri iodid. 3j.
Aquæ Oss. fiat solutio.
Or, ℞.—Creasot. gtt. iv.
Aquæ destillat. f℥ij.—M.

Or, ℞.—Cinchon. rubr. pulv.
Carbon. lign. pulv.
Irid. florent. pulv. aa 3ij.
Mellis 3ij.—M.

A small portion of a paste to be rubbed upon the gums, night and morning. As dentifrices the powders may be used alone.

When the gums will readily bear the tooth-brush, gently astringent dentifrices may be used.

It need scarcely be said, that if the nutrition of the gums be deranged by reason of the state of the teeth or their sockets, the cause, where this is practicable, must be removed; and where the washes and other preparations, already described, prove insufficient, washes of the nitrate of silver, or stronger solutions of creasote, may be had recourse to, applied by means of a camel's hair pencil. When the affection is connected with an asthenic condition of the system, such as prevails in scorbutus, or when there is simple disorder of the system of nutrition of the part, owing to derangement of the digestive apparatus in particular, these conditions must be removed by appropriate remedies.

A more violent form of Epulis is occasionally seen, in which the spongy gums throw out polypous excrescences, which bleed on the slightest touch, and are often connected with some *vice* in the system, or disease about the alveolar processes. These must be removed by the knife, and every care be taken that the whole of the disease is extirpated, otherwise they may return. They are accompanied by great pain and irritation; and, sooner or later, the system sympathizes, hectic fever is established, and, unless a stop is put to the disease, a fatal termination ensues.

III. SHRINKING OF THE GUMS.

SYNON. Ulatrophia, Falling away of the Gums.

Under the influence of mercurials, the gums shrink from the teeth, so that they become loose in their sockets; but this condition passes away along with the other effects of the agent that induced it. In other cases, a similar shrinking of the gums occurs independently of such agency; the teeth are left exposed, and at times fall out, without exhibiting any evidence of decay. This is often owing to incrustations of tartar, which—as has been shown—give occasion to ulcerative absorption of the gums. Where such is the case, scaling the teeth is the obvious remedy. In other cases, it is important to scarify the gums, and to endeavour to excite a new action in them by any of the stimulating applications described under EXCRESCENCE OF THE GUMS.

SECTION IV.

DISEASES OF THE VELUM PALATI AND UVULA.

The velum pendulum, and the uvula, are liable to inflammation; the latter affection being known under the names *Staphylitis, Uvulitis, Cionitis, Angina Uvularis, Inflammatio Uvulæ, Falling down of the Palate;* Fr. *Inflammation de la Luette;* Ger. *Zapfenentzündung, Entzündung des Zapfens, Niedergeschossener Hück;* the former under those of *Hyperoïtis, Angina Palatina;* Fr. *Inflammation du Palais;* Ger. *Entzündung des hängenden Gaumens.* The symptoms, causes, anatomical characters, and treatment, are essentially those of stomatitis and pharyngitis.

In certain cases, both the velum and the uvula are much swollen and infiltrated, (*staphylœdema,*) and interfere both with deglutition, and respiration, but especially the former. When very greatly infiltrated and pendulous, they may give rise to threatening of suffocation. Scarification, or excision of the prolapsed membrane, is the best remedy. At times, the inflammation presents an asthenic appearance, having a dusky, red hue, and the capillary vessels are evidently much distended. Scarification is here essential, and afterwards the employment of stimulant gargles. Occasionally, after the inflammation has subsided, the uvula remains permanently relaxed and elongated, so as to excite a very troublesome cough, and to induce the suspicion of serious thoracic mischief. Inspection of the throat will sufficiently indicate the affection. Provided this form of *staphyloncus* does not yield to the excitant and astringent gargles mentioned under the next chapter, it will be advisable to remove a portion of the uvula, which is a simple operation.

CHAPTER II.

DISEASES OF THE PHARYNX AND ŒSOPHAGUS.

To several of the affections of the throat, the terms *Angina* and *Cynanche* have been given by the older writers, and they are still retained by many of the more modern. They have been applied, however, to so many different affections, that they ought to be discarded. For example, simple cynanche or angina means the common sore throat or inflammation of the mucous membrane of the fauces; whilst angina pectoris has been appropriated to an anomalous affection, in which the parts about the fauces are in no wise concerned. In like manner, we have Cynanche tonsillaris, C. parotidæa, C. laryngæa, &c., to designate, respectively, inflammation of the tonsils, parotid gland, larynx, &c.* These we shall consider in their appropriate places.

I. INFLAMMATION OF THE FAUCES.

Synon. Isthmitis, Angina, Cynanche, Empresma Paristhmitis, Paristhmitis, Paristhmia, Cauma Paristhmitis, Inflammatio Faucium, Squinancy, Squinsy, Quinsy; Common Sore Throat, Inflammatory Sore Throat; *Fr.* Angine, A. Gutturale, Esquinancie; *Ger.* Bräune, Halsgeschwulst, Halsentzündung, Rachenentzündung, Entzündliche Bräune.

Isthmitis or paristhmitis is an inflammation of the mucous membrane covering the fauces. It is, as has been remarked, the simple angina or common sore throat, and it does not differ in its essential characters from stomatitis, or from simple inflammation of the mucous membranes in general.

Diagnosis.—The symptoms are unequivocal. The patient complains of difficult deglutition; and, on inspecting the mucous membrane covering the fauces, it is observed to be extremely red, dry, and glossy; the secretion, in the first instance, as in other cases of inflammation of the mucous membranes, being diminished; but, subsequently, a ropy mucus being secreted from it, which gives rise to much inconvenience in deglutition. When the inflammation extends to the uvula, and it becomes tumefied, a constant desire for deglutition is experienced; and the elongated uvula and ropy mucus, hanging down into the pharynx, induce violent retching. The inflammation spreads, at times into the posterior nares, the top of the larynx, and the Eustachian tubes, so that the smell, the passage of the air to the lungs, and the hearing may become impaired.

The duration of this affection is commonly brief. It usually passes

* Dr. Symonds, says, the "term *Angina* implies inflammation of the parts bounded anteriorly by the velum pendulum palati and its columns, and posteriorly by the upper part of the pharynx;" but certainly the most common acceptation is more extensive. Like cynanche, it has been usually employed to designate inflammation of some part of the supradiaphragmatic portion of the alimentary tube, and of the air passages above the lungs.

off in a few days by resolution, but, at times, goes on to suppuration. This stage may be detected by the appearance of the different parts of the throat,—the swelling being more decided at some one point than another; and, by passing in the finger, and pressing upon the tumefied portion, the presence of pus may be detected. The character of the pain likewise varies: at first, it is extremely acute on swallowing, but when suppuration has become established it is more dull.

Causes.—As in all cases of inflammation, irregular exposure to cold and moisture, by which the harmony of associated actions is broken in upon, is the cause usually assigned. Hence, it is more common in winter and spring, when cold and moisture exist in vicissitudes, than in the height of summer, or the early part of autumn. Some persons are extremely prone to it on the slightest exposure; and when it has appeared a few times, it is apt to recur by habit,—a predisposition being, in this manner, induced, which requires but a slight exciting cause to develope it. Like stomatitis, it may be caused by hot or acrid bodies irritating the fauces, but this is uncommon.

In very young infants, the mucous membrane of the fauces is apt to be more or less hyperæmic or congested, so as to resemble the redness of inflammation, and to occasion obscurity in the diagnosis. M. Billard, remarks, that the fauces may be considered to be inflamed;—1st, when the duration of the redness continues beyond the ordinary time of the disappearance of the congestion in young infants—ten or twelve days for example; 2dly, when, instead of being uniformly spread over every part of the throat, it occupies separate points; 3dly, when some of the symptoms of amygdalitis, to be mentioned presently, exist along with the redness. The presence of fever, with difficult deglutition, and alteration of voice, will of themselves be sufficient to diagnosticate, that the redness is owing to isthmitis.

Isthmitis—like amygdalitis and pharyngitis—is one of the symptoms of scarlatina and of syphilis, and it is generally present in hydrophobia.

The attending fever, as in amygdalitis, is frequently very active, but the general prognosis is favourable. It almost always terminates in health.

Treatment.—The pulse is rarely so excited as to indicate the necessity of general blood-letting. Confinement to bed, where practicable, and the employment of saline cathartics,[a] chiefly as revellents, will relieve the milder cases.

[a] R.—Magnes, sulphat. ℥vj.
——— carbonat. ℥j.
Aquæ menthæ pip. f℥iij.—M.
Dose, one half, to be repeated if the first half does not operate.

When more severe,—in addition to this management, leeches may be applied around the throat; and, after they have dropped off, a warm emollient poultice may be placed over the leech-bites; and, if the disease still persists, sinapisms, or stimulating liniments,[b] or a blister, may be applied to the throat. Along with these agents, the steam of hot

[b] Liq. Ammon. f℥ss.
Ol. Oliv.
——— Tereb. aā f℥x.—M.

Or,

Lin. sapon. comp. seu
—— camph. f℥iss.
Tinct. cantharid. f℥ss.—M.

water may be inhaled, and the throat be gargled with flaxseed tea, or any mucilaginous fluid.

As the vessels are loosely protected by the parts in which they creep, —after the first day or two, it may be advisable to prescribe gargles which are somewhat stimulating, and may thus cause the contraction of the overdilated capillaries, so that they may force the stagnant blood from them, and be restored to their healthy condition. Gargles of muriatic acid,[a] or of ammonia, or of capsicum,[b] may accomplish this, taking care that they are not made too powerfully astringent or excitant.

[a] R.—Mellis ℥iij.
Acid. muriat. vel
Liq. Ammon. gtt. xxv.
Aquæ f℥vj.—M.

[b] R.—Infus. capsic. f℥vj.
Mellis ℥iij.—M.

M. Velpeau, after M. Bretonneau, has strongly urged the use of alum even in the early stage of every form of angina. He employs it either as a gargle or in powder. The tip of the finger, moistened, is to be covered with powdered alum, and then rubbed over the inflamed parts, the tongue being depressed with the handle of a spoon: it may also be applied with a small brush, or a piece of sponge fixed on the end of a small stick, or it may be blown into the throat through a tube; but M. Velpeau prefers the use of the finger, as it can, in general, readily reach every point of the inflamed surface; and, moreover, an intelligent patient can apply the powder with his own finger. The application should be made twice or thrice a day, and in the meantime the patient should frequently gargle his throat with a solution of from one to four drachms of alum in four fluidounces of barley water. In mild cases, the gargle is found to be sufficient.

Perhaps, however, the most effective agent, at all periods of the disease, is scarification with a lancet, which may be superficial, if the inflammation be confined to the mucous membrane; deeper, if the parts beneath be involved. The author has found the advantage of this course in his own case, and has seen it successful when practised on others. Where suppuration has taken place, the pus may be left to itself to make its way outwards; but the best course is to give issue to it, especially if it interfere with deglutition or respiration.

II. INFLAMMATION OF THE TONSILS.

Synon. Amygdalitis, Cynanche Tonsillaris, Angina Tonsillaris, A. cum tumore, A. Synochalis, A. Sanguinea, A. Vera et Legitima, Inflammatio Tonsillarum, Tonsillitis, Antiaditis, Antiadoncus Inflammatorius, Paristhmitis, Empresma Paristhmitis Tonsillaris, Quinsy, Inflammatory Sore Throat, Sore Throat; *Fr.* Amygdalite, Inflammation des Amygdales, Angine Tonsillaire, Pharyngite Tonsillaire, A. Gutturale Inflammatoire; *Ger.* Entzündung der Mandeln, Mandelnentzündung.

The essential difference between inflammation of the tonsils and isthmitis is, that in the former, along with the ordinary signs of inflammatory fever and the local symptoms accompanying isthmitis, on inspecting the throat the tonsils are found greatly enlarged,—in some cases, so as almost to meet. Along with this, there is extreme difficulty in deglutition, and the sensation of a foreign body in the throat during the effort. In the early part of the disease, the membrane covering the

inflamed part is dry, and, at times, has white specks upon it of the diphtheritic kind.

To inspect the throat well, in this as in other diseases, the patient should be directed to open his mouth widely; the tongue must then be depressed with some flat body, as the handle of a spoon; and, if he be directed to draw in a full breath, the tonsils can generally be seen without much difficulty. With some, the use of the spoon is unnecessary.

MM. Andral and Gavarret analyzed the blood of four persons suffering from amygdalitis; and always found in a greater or less degree the characters of hyperinosis. The quantity of fibrin was in one case as high as 7·2; and there was a decided decrease in the quantity of red corpuscles. The urine, in a case observed by M. Becquerel, possessed the characters belonging to inflammation, in a high degree. It was red, and had the high specific gravity of 1029·7. In another case, it was dark coloured, and had a specific gravity of 1023·9. In neither case was there any sediment; but in the second, on the 17th day, an abscess, which had formed in one of the tonsils, opened, and on that day alone there was a spontaneous sediment of uric acid, and the specific gravity rose to 1025·2. In three other cases, in which the fever was not so high, the specific gravity remained lower.

Generally, amygdalitis terminates by resolution; but not unfrequently it ends in suppuration, or in permanent enlargement of the tonsils. It is asserted to affect children and females more especially; but this is questionable. Testimony, indeed, is not wanting to show, that males are more frequently attacked with it than females. The left tonsil, in the observation of many, is more frequently affected than the right.

Treatment.—This is much the same as in isthmitis. General bloodletting is rarely needed. The depletion and revulsion, effected by the application of leeches to the throat, followed by a warm cataplasm, are more efficacious. Revellent cathartics and sinapised pediluvia, with the use of excitant liniments or sinapisms to the external throat, and emollient and cooling gargles, with the inhalation of steam, constitute the main treatment in the early stages; and, when suppuration threatens, it must be fostered, and the abscess be treated in the manner recommended under Isthmitis.

With the view of cutting short this phlegmasia as well as others, the free use of pulvis ipecacuanhæ et opii, aided by warm diluents, has been strongly recommended by Dr. Christison.

Cases have occurred, in which the danger of suffocation has been so imminent, that it has been advisable to perform the operation of laryngotomy or tracheotomy.

When an abscess has formed in the tonsils, it generally breaks during some effort of the organs concerned in deglutition, and frequently the discharged pus has a fetid odour: in other cases, the abscess makes its way externally; but this is rare and more frequently occurs in the anginose affections of the throat that form a part of scarlatina.

When the tonsils remain permanently enlarged after amygdalitis, and interfere with deglutition or the voice (*angina scirrhosa*,) they can be readily removed by an appropriate instrument. At times, how-

ever, the enlargement passes away under the use of powerful stimulants, as of the capsicum in the form of infusion. The application of the solid nitrate of silver, or of deliquescent iodide of zinc, freely over the surface of the enlargement has likewise been of service.

The iodide may be applied pure by means of a camel's hair pencil, or of a piece of sponge attached to a suitable handle. It must be held on for a short time, and the application may be repeated every two or three days, until the effect is produced. It is followed by a pungent smarting, which continues for twenty or thirty minutes, but by no other inconvenience. Dr. Goddard, of Philadelphia, is said to have used it extensively, and speaks very favourably of its effects. He finds it has the property of inducing a rapid absorption of the enlarged tonsil, by a kind of shrivelling process, without the formation of a slough. It does not, like chloride of zinc, spread to the surrounding structure, and hence may be used without the fear of injury from being swallowed.

It must be borne in mind, that, in the evolutions which take place at puberty, a change in the nutrition of the tonsils not unfrequently occurs, under which the enlargement totally disappears.

Dr. Isaac Parrish, of Philadelphia, has observed a peculiar change of the voice induced in two cases by the excision of the tonsils. It was rendered shrill and whistling,—indicating the influence exerted upon the function by a special modification of the vocal tube.

At times, the enlarged tonsils affect not merely deglutition or the voice; but, by their pressure on the Eustachian tubes, they greatly impair the sense of hearing, and interfere with the passage of air through the nose, by forcing up the velum; and hence children, thus affected, sleep with the mouth open. They may also give rise to a constant, dry, troublesome cough; and, owing to the air never passing through the nose, the organ does not become properly developed, but remains narrow. The most serious result, however, that has been ascribed to them, is a lateral flattening of the chest, to which attention was first directed by M. Dupuytren. A recent writer, M. Robert, thinks that it is produced by the enlarged tonsils preventing the entrance of air at each inspiration, in sufficient quantity to fill the vacuum in the chest, and thus to cause a pressure from within the lungs equivalent to the atmospheric pressure without. This thoracic deformity gives occasion to dyspnœa, palpitation, &c., and hence, children in whom it exists are usually pale, thin, and weak.

In rare cases, *calcareous concretions* have been found in the tonsils.

III. INFLAMMATION OF THE PHARYNX.

Synon. Pharyngitis, Angina Pharyngea, Cynanche Pharyngea, Empresma Paristhmitis Pharyngea, Inflammatio Pharyngis; *Fr.* Angine Pharyngée, A. Gutturale; *Ger.* Entzündung des Schlundes, Schlundentzündung.

This affection differs from isthmitis only in its seat: similar tissues are implicated in both; it is induced by the same causes and requires the same treatment. It is detected by inspection of the throat, when the inflammation is observed to be seated in the mucous membrane covering the posterior parietes of the pharynx. At times, it spreads

into the nasal fossæ, and, at others, implicates the larynx; but the respiration and voice are often—generally, indeed—unaffected. At other times, the voice is raucous, as in the various forms of angina. It is frequently accompanied by amygdalitis.

The disease generally passes off by resolution; but pus may form, and require to be set free. This may be done by the pointed bistoury, or by an appropriate instrument, termed *pharyngotome*. It has been advised, too, when there was reason to suppose the existence of an abscess, that an emetic should be administered, in order that the rupture of the walls might be favoured by the efforts at vomiting. As the object, in such case, is not to induce any revulsion, one of the direct emetics, or those which operate without inducing any previous nausea, is to be preferred.[a]

[a] R.—Zinci sulphat. gr. xx.—xxx. To be taken in sugared water. Or, R.—Cupri sulphat. gr. ij.—x. To be taken in the same manner.

Not long ago, the author met with a case of pharyngitis, which appeared to be of the rheumatic kind, and to be seated in the constrictor and stylo-pharyngei muscles. The pain, on pressure being made at the sides of the neck, was very severe; and when fluid was taken, owing to the irregular and spasmodic action of the muscles, it was partly returned by the mouth and nose. Leeching and the general antiphlogistic treatment produced a cure.

Pharyngitis, like stomatitis and isthmitis, may terminate by the formation of false membranes, or by gangrene; varieties which will require a separate notice.

Postpharyngeal or *retropharyngeal abscess*, as it has been termed, may form idiopathically behind the posterior paries of the pharynx. It is not confined to any period of life, but would seem to be most apt to occur from the age of a few weeks up to four years. It may be either acute or chronic,—the former being more frequent. Nothing but an attentive examination of the pharynx can prevent the affection from being mistaken for croup. In it, however, the difficulty of deglutition precedes that of respiration, whilst in croup, unless when complicated with amygdalitis or pharyngitis, there is no difficulty of deglutition. It has, also, been mistaken for œdema of the glottis, but in the latter affection the difficulty of inspiration, as compared with the facility of expiration, is a ground of distinction,—in the former both being alike impeded.

In some cases, the abscess opens and the pus is discharged,—the patient recovering; in others, suffocation supervenes, and in others, again, death takes place by asphyxia, owing to the compression occasioned by the abscess; and in long protracted cases, death may occur from defective nutrition,—caused by the interruption to deglutition.

When the abscess is recognised, it must be opened, if practicable. Where this can be done, recovery almost always takes place.

a. *Follicular Inflammation of the Pharynx.*

Synon. Follicular Pharyngitis.

This variety of inflammation—so far as the author knew, when the first edition of this work was printed (1842)—had not been described

in pathological or therapeutical treatises; yet it is by no means uncommon, and, of late, has been the subject of many essays. He has seen numerous cases of it; and it is very frequently presumed to be an affection of more dangerous import than it really is. Many of the cases of what has been called *Clergyman's Sore Throat*, which have fallen under his care, have been of this affection. It has been described by Dr. Popken, under the name *Tubercles of the Larynx and Fauces;* but he at the same time remarks, that he gives the name at the risk of its being objected to, inasmuch as the disease does not consist of true tubercles, but only of diseased mucous follicles.

Diagnosis.—Follicular pharyngitis is first indicated by huskiness of the voice, with more or less coughing and hawking, so that the disease appears to involve the respiratory rather than the digestive, organs—especially as there is often little or no pain on deglutition. Should, however, uneasiness of the throat suggest an inspection, the appearances are such as cannot be mistaken. The follicles of the isthmus of the fauces and the pharynx are observed to be unusually apparent, so that the mucous membrane seems to be studded with granulations, varying, in size, from a pin's head to a pea. The larger bodies frequently have the appearance of a split pea, and of crypts or follicles distended with a semi-fluid substance.

The disease is apt to persist for a long time, even for years, and to give occasion to more or less irritation of the larynx, as indicated by coughing and hawking; but still the general health may remain unaffected, unless the affection should exist also in the larynx, when it may, by irritation, in one of tuberculous predisposition, occasion the formation or development of tubercles of the lungs. It generally occurs in young subjects, rarely before puberty, or in advanced life, and, it is affirmed by Dr. Popken, chiefly in the male sex. He remarks, that he never could trace any connexion between this form of pharyngitis and any constitutional chronic disease, as syphilis, or scrofula; and that he has so rarely found it coincident with other local affections, and especially with those of the lungs, that, in a doubtful diagnosis, he rather regards the disease in the throat as a sign, that there is not a vomica in the lungs. Certainly, in the cases that have fallen under the author's care, there was no chronic pulmonary disease.

The author has always regarded the affection to consist in an accumulation of mucus in the follicles of the throat, similar to that which takes place in the congenerous sebaceous follicles of the skin in acne; and in a case, which he saw with his friend, Professor R. M. Huston, the enlarged follicles presented all the appearances of acne punctata. Occasionally, the follicles break, and discharge small masses of an elastic matter, which is often the source of much anxiety to the patient, causing him to apprehend serious pulmonary mischief. Sometimes, ulceration succeeds, which may be defined, or irregular, and is often surrounded by a vivid red inflammation. This may continue for a long time, when the tone of the constitution is impaired, or some scrofulous or other *vice* exists.

Treatment.—The local remedies, to be recommended in follicular inflammation, are the same as those advised in other forms of sluggish

phlegmasia of the mucous membrane of the pharynx. A solution of nitrate of silver, or a creasote lotion, with the application of croton oil to the exterior of the throat, comprise the local means that are most beneficial. Time, however, is an element in the cure, as the disease is essentially chronic in its character. It is advisable, too, to keep the throat warm. This may be done, in the female, by wearing flannel around the throat, and in the male in the same manner, or by permitting the hair to grow around the neck. A nutritious, but not stimulating diet, and the administration of aromatic and tonic medicines, such as ammoniacum and myrrh, or myrrh, extract of bark, and sulphate of iron, has been recommended; but the author has not observed much effect from such agents. Like acne of the face, it is often, indeed, but little under the influence of medicine; and even change of air and the use of therapeutical agents, that essentially modify the system of nutrition, are of but limited efficacy. The parts, however, gradually become accustomed to the presence of the enlarged follicles, so that little or no irritation is ultimately induced by them. In process of time, too, they may be gradually diminished by absorption; yet in one case, which was subjected for years to the treatment mentioned above, the follicles remained almost as large and prominent as at first. They had ceased, however, to excite uneasiness.

In cases of ulceration of the pharynx, it may be necessary to employ a solution of nitrate of silver, or creasote water, or a diluted mineral acid, and, if these fail, solid nitrate of silver. If any *vice*, however, exist in the constitution, it is indispensable that it should be removed by the agents that are appropriate to the particular cachexia. Usually, there is a state of defective, along with disordered, action, which demands the use of tonics, and especially of iodide of iron, for a long period.

℞.—Ferri iodidi gr. xxiv.
Aquæ destillat. f℥j.—M.

Dose, an ordinary teaspoonful—which contains about three grains—two or three times a day, in simple syrup. The dose to be gradually increased.

b. *Diphtheritic Inflammation of the Pharynx.*

Synon. Angina Pseudo-Membranacea, A. Membranacea, A. Pellicularis, A. Plastica, A. Diphtheritica, A. maligna, Pharyngocace, Pseudo-Membranous Inflammation of the Throat, Diphtheritic Pharyngitis, D. Sore Throat; *Fr.* Angine Couenneuse, A. Gutturale Couenneuse, A. Pseudo-Membraneuse, A. Plastique, A. Diphthéritique, Diphthérite (*Bretonneau*); *Ger.* Rachencroup, Brandige Bräune, Schlundfäule.

Under the head of Stomatitis, two varieties were described, which, in their essential characters, resemble the same form of inflammation, when it attacks the mucous membrane implicated in isthmitis and pharyngitis. It may be convenient, therefore, to consider here pseudo-membranous inflammation of the throat in general.

Diagnosis.—The disease is often insidious at its onset;—deglutition being less affected than in isthmitis or amygdalitis, and neither fever nor general indisposition being present. At other times, an uncomfortable feeling of heat and dryness is experienced in the throat, with fever, difficult deglutition, and pain on moving the neck, which is observed to be slightly swollen. After this, the cervical and submaxillary glands may become enlarged, and the difficulty of deglutition

appears to be rather in a ratio with this enlargement, than with that of the diphtheritis of the pharynx. At times, the parotid glands enlarge, and, in particular epidemics, this enlargement has been observed to precede, or accompany, the formation of false membranes. At this early stage, the pharynx, on inspection, may merely exhibit more or less redness and tumefaction of one or both tonsils; but it rarely happens, that the physician sees the case at this early period. Generally, when he first observes the throat, he finds the membrane investing the velum pendulum, uvula, tonsils, and pharynx, exhibiting small, white or yellowish patches, irregularly circumscribed, and having a lardy or curdy appearance, and in some cases, it is not until these exudations have been thrown out, that the submaxillary glands and cervical ganglions become swollen. The patches are, at first, small and discrete; but they gradually approach until they ultimately coalesce, become confounded, and cover, at times, in a very short period, the whole of the pharynx, extending into the nasal fossæ and the air passages.

Owing to the semi-transparent character of the pellicles, the parts beneath—especially the velum palati and uvula—appear infiltrated. Where the inflammatory tumefaction is most marked, they are thickest, and are bounded by an elevated red circle, which gives them the appearance of being depressed, and of ulcerations. In a short time, however, they project, become partly detached, and a slight oozing of blood, sufficient to colour the saliva, takes place from the parts beneath. The exposed mucous membrane appears red, dotted, injected, or ecchymosed. At times, however, it is of a gray colour, and dry, as if it had been cauterized by an acid; at others, eroded, but without any appreciable loss of substance. The nasal fossæ soon participate in the disease; and from both the mouth and nose there is a copious discharge of a sanious and fetid fluid, and occasionally epistaxis so violent as to require plugging the nasal fossæ. The pellicles or shreds, when thrown off, are reproduced, but their successors are usually thinner, and of a whiter appearance. The quantity of false membrane, disengaged in this manner, is surprising; and it has been conceived, that this circumstance, along with the offensive odour exhaled from the mouth, especially in adults, led the older observers to mistake their nature, and to regard them as sloughs. In place of being thrown off as shreds, the false membrane is at times softened and mixed with the saliva, and in some cases absorbed.

The general symptoms that usually accompany this condition are —paleness and puffiness of the face, with alteration of the features; tumefaction of the tongue, with redness of the edges, and a thick coat covering its surface,—vomiting most commonly accompanying the efforts to get rid of the membrane. Constipation or diarrhœa may be present, but the latter is more common.

Whilst the diphtheritic inflammation affects the throat, there is a singular tendency to the same kind of exudation from all surfaces from which the cuticle has been removed,—from the lips, alæ nasi, behind the ears, around the anus, vulva and nipples, and from the surface of blisters or leech-bites. The author saw, some time ago, a

fatal case of diphtheritic pharyngitis, which extended into the larynx, and for which a blister was applied to the chest. The blistered surface became wholly covered with a pultaceous exudation; and the case terminated unfavourably owing to the supervention of gastritis. Generally, indeed, when diphtheritic pharyngitis terminates fatally, it is owing to the disease invading either the stomach and intestines, or the air passages,—more frequently the latter, giving rise either to tracheitis, bronchitis, or pneumonia. This result has to be apprehended in the epidemic form; but usually, when the disease occurs sporadically, and is without complication, it terminates in health. Its mean duration is estimated at from fifteen to twenty days. In ordinary isthmitis, or common inflammatory sore throat, grayish patches or specks are at times perceptible, which are the source of uneasiness to the medical attendant; but the circumstance of their not extending, and being of but transient duration, soon satisfies him that he has not to fear the supervention of true diphtheritic pharyngitis.

Causes.—The remarks made as to the etiology of diphtheritic stomatitis are equally applicable to diphtheritic pharyngitis. It appears in all climates and seasons, but chiefly, it is affirmed, in moist countries. It may occur sporadically, as in the fatal case referred to above; endemically, especially where persons are crowded together in restricted spaces; and epidemically,—the last being the most frequent form of all. Children are more liable to the disease than adults, and it is more dangerous in their case, owing to their being more predisposed to serious affections of the air passages. As in cases of diphtheritis in general, opinions have varied as to whether it be capable of being communicated by contagion. Some have believed strongly in the existence of a specific contagion. Yet, when the matter of false membrane has been inserted into the arm, the tonsils, and soft palate, no diphtheritis has ensued. It has been asserted, indeed, that where many persons are crowded together, and where ventilation is imperfect, and cleanliness disregarded, there can be no question as to the generation of a contagious influence, capable of transmitting the disease from one person to another. This, however, is doubtful. That different individuals, exposed to such extraneous influences, have been attacked simultaneously, or in succession, with diphtheritic pharyngitis, cannot admit of question; but this can be explained without supposing the action of any contagious emanation. The observation of the author has not led him to speak positively upon this subject; but the result of personal investigation and of the comparison of evidence leads him rather to favour the doctrine of noncontagion.

Pathological Characters.—The diphtheritic form of pharyngitis—like diphtheritis in general—is inflammation, differing from the simple inflammatory affections of mucous membranes. A predisposition to the formation of false membranes exists, we have seen, so that they occur on parts of the external cutaneous surface, from which the epidermis has been removed. The state of the constitution in which they are most frequently observed is one of deterioration, under which the circulating fluid doubtless differs from its healthy state, and impresses the intermediate system of vessels, through which the nutrition of the tis-

sues is accomplished, in a peculiar manner; but of the intimate nature of the morbid action we are in entire ignorance. Without some predisposition, simple pharyngitis neither terminates in pseudo-membranous, nor in gangrenous pharyngitis. These varieties appear to be separate and distinct, and can generally be marked by the observer almost from the very outset of the disease.

Treatment.—This may be divided into the *general* and the *local*.

1. The general treatment must be regulated by the symptoms. Although diphtheritic pharyngitis usually occurs in impaired states of the system, there may be cases in which antiphlogistics may be employed with much advantage. It can rarely happen, however, that general blood-letting is needed; and the application of leeches is often attended with the inconvenience, that the leech-bites become attacked with the diphtheritis. It can only be at the commencement of the disease, and in cases in which the vital powers are active, that they can be used with any prospect of benefit. In light cases, gentle laxatives, cooling drinks, and emollient gargles, of the kind advised under Isthmitis, with stimulating liniments to the neck, or warm cataplasms, will generally lead to a successful issue. Diluents, in considerable quantity, have been recommended to dilute the mass of blood and diminish its plasticity,—under the view, that diphtheritic pharyngitis is owing to too great plasticity of that fluid, the concrescible portion of which exudes at the surfaces implicated. The temperature of these diluents may be regulated by the degree of activity of the heart and arteries. If this be great, the skin hot, and the thirst considerable, ice and ice-cold drinks may be permitted. If, on the other hand, the activity of the sanguiferous system be less, and the surface cool, tepid or even warm drinks should be recommended. Perhaps, in all such cases, diluents—as they are termed—act chiefly by allaying the local irritation for the time; for, when the mucous membranes are affected with any form of inflammation, absorption does not take place readily from them, so that no great effect can be expected from their diminishing the consistence of the blood.

Emetics have been recommended in all stages of the disease;—in the early period, for the removal of any morbid secretions, which can scarcely fail to be present in the stomach in such a condition of the lining membrane, as well as to produce revulsion; and in the later periods, with the view of dislodging and expelling the false membrane, which often accumulates in the throat, and gives rise to great irritation.

At the early period, where revulsion is the object, the indirect emetics, tartrate of antimony and potassa, or ipecacuanha, or both,[a] may be prescribed: in the latter period, where simple evacuation is desired, the direct emetics, sulphate of zinc (3ss. in sugared water,) or sulphate of copper (gr. ij.—vj. in sugared water).

[a] R.—Antim. et potass. tart. gr. ij.
Ipecac. pulv. gr. xx.—M.
To be given in warm water.

Throughout the whole course of the disease the bowels must be kept open, to prevent the accumulation of morbid secretions, which

would add to the irritation. The mild laxatives are the best: teaspoonful doses of castor oil, or rhubarb and magnesia, or gentle salines—as the Rochelle salts (tartrate of potassa and soda), or the common Seidlitz powders; but, in all cases, due attention must be paid to the condition of the lining membrane of the stomach and bowels, which, as has been remarked, is apt to be implicated in the disease under consideration. Where such implication exists, the canal may be kept clear by laxative enemata. Calomel has been recommended by some therapeutists; but it has not been given so much as a cathartic as to induce the effects of mercury on the system, and by the new action to break in upon the morbid catenation. It has been properly suggested, however, by M. Forget, that caution is demanded in the use of a remedy, whose tendency is to affect the parts about the mouth, and which may thus aggravate the disease.

When the patient is debilitated, and the powers of life begin to fail, recourse must be had to tonics and gentle excitants; but these must be administered with caution, and be gradually discontinued, if the tongue should become dry, and the local or general symptoms appear to be aggravated by them. The cold infusion of cinchona,[a] with or without the addition of mineral acids, and wine whey, are as valuable agents as can be selected.

[a] R.—Cinchon. contus. ℥j.
Aurant. cort. ℥iij.
Aquæ Oj.—M.
Dose, a wineglassful four times a day.

2. Notwithstanding a diathesis exists, which predisposes to diphtheritis, great reliance has been placed upon the local treatment. Of the local remedies, employed at the present day, nitrate of silver has been preferred. It may be applied in the solid, or in the liquid form. When used in the solid form, the affected parts may be gently touched with it, twice or thrice a day, the patient rinsing the mouth and throat, subsequently, with any tepid fluid. When used in the liquid form, the ordinary strength may be 15 or 20 grains to the ounce of water; but, by some, it is employed much stronger than this—one part of the nitrate to five or six parts of water, and even a saturated solution; with this a piece of sponge, tied to a small piece of stick, may be moistened, and the fauces be touched gently with it two or three times a day. Another plan, which has been advised, is to reduce the nitrate to powder, roll the sponge—previously moistened with mucilage of gum arabic and squeezed—in it, until a sufficient quantity of the powder adheres to the surface, and apply it in the manner recommended above. Muriatic acid has been highly extolled in the same cases;—at times, in an undiluted state; at others, mixed with honey;[a] and, in either case, applied once or twice a day, in the same manner as the solution of nitrate of silver.

[a] R.—Acid. muriat. p. j.
Mellis p. ij.—iij.—M.

It is, doubtless, safer to commence with the dilute acid, and, subsequently, if necessary, to have recourse to the pure.

Powdered alum appears to possess the property of dissolving false

membranes, whilst, at the same time, it induces a new action in the parts beneath. It may be blown into the throat by means of a quill or glass tube, or be applied in the manner recommended in the case of the powdered nitrate of silver, or of the solution of that salt; that is, by means of the sponge,—one part of the powdered alum to two or three parts of water. Calomel has been administered in the same manner, but it is deserving of less confidence than the agents just mentioned. The sulphate of copper, too, is much used in some countries. An obvious inconvenience results from the use of all powders thus administered, in their liability to enter the glottis, and excite cough: still, the inconvenience soon passes away. Sulphate of copper has likewise been applied in saturated solution, and, it is said, with satisfactory results. A decoction of soot[a] has been used with benefit, and there can be no doubt, that impure pyroligneous acid and creasote would prove as advantageous as in similar affections of the mouth.

[a] R.—Fulig., manipul. ij.
Aquæ Oj.—M.

The offensive character of the secretions from the mouth suggested the use of chlorinated preparations, in the form of gargle.

R.—Calcis chlorin. ℥i.—℥iij.
Aquæ f℥viij.—M.

Or, R.—Liq. sodæ chlorin. ℥ij.
Aquæ f℥viij.—M.

Advantage might also accrue from their internal administration, as well as from that of chlorine. They may be serviceable, applied externally, not only as disinfectants but as antiseptics.

When the throat cannot be readily reached by the sponge or mop, and gargling is impracticable, the gargles and disinfecting washes may be thrown through the mouth by means of a syringe, and through the nostrils, should the posterior nares be affected. It need scarcely be observed, that the strength of the applications, and the number of times they should be employed, must be left to the judgment of the practitioner.

The vapours of ammonia, ether, and chlorine, have been advised; but their efficacy has not been marked, whilst the irritation they have induced has been considerable. They are unmanageable, and ought, perhaps, to be abandoned.

Revellents, applied to the throat, may be employed with advantage along with the topical remedies just described. Caution may be demanded in the use of blisters, as they are apt to excite diphtheritis of the skin; but sinapisms and stimulating liniments[a] to the throat and the extremities may be prescribed with benefit.

[a] R.—Liq. ammon. part. j.
Ol. oliv. part. iv.—M.

Sinapised pediluvia may be directed throughout the whole course of the disease. The diet must be left to the judgment of the practitioner. Generally, it may consist of farinaceous aliments; but no invariable rules can be laid down: as in every other disease, it must be appropriate to the various stages.

c. *Gangrenous Inflammation of the Pharynx.*

Synon. Angina Gangrænosa, A. Maligna, A. Putrida, A. Ulcerosa, Pestilens Faucium Affectio, Cynanche Maligna, Empresma Paristhmitis Maligna, Cynanche Ulcerosa, C. Gangrænosa, Gangræna Tonsillarum, Pharyngocace; Ulcerous, Ulcerated, Putrid, or Malignant Sore Throat; *Fr.* Angine Gangréneuse, A. Maligne; *Ger.* Bösartige Bräune, brandige Bräune.

This variety of Pharyngitis has been esteemed by some to be essentially the same as the one just described; but the generality of modern pathologists class them as congenerous yet distinct affections. It certainly differs essentially from simple pharyngitis, for, although the latter may terminate in gangrene, it is an accidental event; whilst gangrenous pharyngitis is marked from the first by its characteristic symptoms. These are eminently typhous, and the decided difference between gangrenous and diphtheritic pharyngitis, after all, consists in this circumstance. It is not improbable, however, as has been suggested by M. Bretonneau, that many of the cases of *Angina maligna*, *A. putrida*, *Cynanche maligna*, and *Affectio pestilens faucium*, which were described by our ancestors as having occurred epidemically, belonged to diphtheritic pharyngitis.

Gangrenous pharyngitis is well seen in the malignant form of scarlatina, but is not peculiar to it. It occurs at times sporadically; at others, epidemically, and without any eruption; and at others, again, with the eruption of scarlatina. The inflammation rapidly runs on to gangrene, implicating the neighbouring portions of the neck; and generally terminating fatally—at times suddenly—on the second, third or fourth day of the disease.

Diagnosis.—The symptoms are, from the first, of an appalling character, and essentially those of scarlatina maligna. After more or less indisposition—chilliness, headache, vertigo, nausea and faintness—slight pain is experienced in the throat, occasionally with swelling of the neck, which, as in ordinary diphtheritis of the pharynx, impedes its movements. Soon afterwards, the neck face, chest, and upper extremities, especially, assume a red colour, more or less deep, and become slightly tumefied. The fever is usually intense; the heat being pungent (*calor mordax*), with great restlessness, delirium, and often stupor and coma; the tongue is dry, and covered with a fuliginous crust, as well as the lips, which crack, and appear as if burnt. The parotid glands swell, and diarrhœa, epistaxis, or some other form of hemorrhage supervenes, with petechiæ and every symptom of typhus. On inspecting the throat, the lining membrane is found to be of a deep red or purple hue, upon which patches of a pulpy consistence, and dull ash colour, changing speedily to brown or black, are perceptible. The parts soon begin to slough, and a putrid odour is exhaled. The sloughing proceeds rapidly, involving the soft palate, the substance of the tonsils, and, at times, the cheeks, and the parotids. From the nose an ichorous and offensive sanies is discharged, and the lips and corner of the mouth become implicated in the morbid condition.

Treatment.—This does not vary from that required in gangrenous stomatitis, and in the variety of pharyngitis last described, except that

in diphtheritic pharyngitis, the symptoms are not so markedly those of depression. The internal management is that required in typhus: the local, that adapted for diphtheritic pharyngitis and gangrenous stomatitis; the different accidents that arise in the course of the disease, as well as the disease itself, being met on great general principles.

IV. INFLAMMATION OF THE ŒSOPHAGUS.

Synon. Œsophagitis, Inflammatio Œsophagi, I. Gulæ, Angina Œsophagea, Cynanche Œsophagea; *Fr.* Œsophagite, Inflammation de l'Œsophage, Angine Œsophagienne; *Ger.* Entzündung der Speiseröhre, Speiserohrenentzündung.

Inflammation of the œsophagus is a rare disease, and differs from inflammation of the pharynx only in its seat.

Diagnosis.—The chief symptom is local pain, with difficult deglutition, and, at times, hiccough, after the alimentary bolus has cleared the pharynx, and reached the seat of the inflammation. The pain is felt either anterior to the cervical vertebræ, under the sternum, between the shoulders, towards the cardia, or under the xiphoid cartilage, according to the precise position of the inflamed spot,—the local symptoms being accompanied with the general signs denoting the presence of internal inflammation, which vary in degree, according to circumstances. The disease commonly terminates by resolution, so that no opportunity occurs for tracing its pathological characters, which must, however, be the same as those of inflammation of the mucous membranes in general.

Causes.—Injuries of the mucous membrane, produced by swallowing sharp or pointed bodies, as pieces of bone, or hot or acrid substances, must be ranked amongst the most common causes. It may occur, however, from organic changes, the causes of which are as inappreciable as those of other inflammations.

Treatment.—As the disease is rarely severe—restricting the patient to emollient drinks, and allowing these but rarely; to the use of ice or lemonade, with the application of simple or sinapised cataplasms to the neck and of sinapisms to the feet, with laxative and gently excitant enemata, will be sufficient. Should, however, the inflammatory symptoms be more violent, general blood-letting may be needed in addition, with the application of leeches externally along the seat of the pain.

V. STRICTURE OF THE PHARYNX AND ŒSOPHAGUS.

Synon. Dysphagia Constricta, D. Pharyngea, D. Œsophagea, D. Callosa, Strictura Pharyngis seu Œsophagi vera, S. Œ. Callosa, Stenochoria Œsophagi, Œsophagiarctia; *Ger.* Verengerung, Verhärtung, Verdickung, Callosität der Speiseröhre, Speiseröhrenerweiterung.

This affection may be the consequence of œsophagitis, but more frequently it is owing to malignant disease in the parietes of the œsophagus. Most commonly, it occupies the upper portions of the tube. It may take place insidiously; the patient not suspecting a gradual diminution in the calibre of the tube, until he discovers a progressively increasing difficulty in swallowing solids, until ultimately nothing but liquid aliment can reach the stomach. The hypertrophy usually occurs in the submucous tissue, which forms a kind of ring, gradually

encroaching on the tube. Sometimes this is of cartilaginous or osseous hardness, yet without being malignant; and, occasionally it encroaches so completely on the œsophagus, that the patient dies from want of sustenance. Usually, when the tube has become very narrow, the food accumulates above the stricture, so as to form an expanded portion or pouch, (*Pharyngeurysma*,) and at times, the quantity retained there is surprising. Sooner or later, however, an effort of regurgitation ensues, and the food is returned.

Although the stricture commonly goes on progressively increasing, it is arrested at times, so that the individual may pass through a long life, and die of some other affection. The author is acquainted with a case, in which food more solid than pap does not pass into the stomach, but accumulates in the manner described, and is subsequently regurgitated; yet the gentleman has remained in this condition for many years. Some idea of the seat of the disease may be formed by the quantity of food that may be taken before it is regurgitated; but this is obviously an uncertain criterion. It may be readily detected by the bougie.

Treatment.—The only remedy on which any reliance can be placed is the œsophageal bougie, by which the stricture may occasionally be dilated—if not altogether, to such a degree as will admit of ready deglutition of liquid food, as light boiled eggs and soups, which may form the main sustenance. Hope, too, may be entertained, that the farther progress of the disease may, in this manner, be arrested. Internal remedies that modify nutrition, and are recommended under the next head, may likewise be given; and should the passage become entirely obstructed, alimentary matter may be thrown into the colon, by which a miserable existence may be prolonged for a short time.

VI. CANCER OF THE PHARYNX AND ŒSOPHAGUS.

Synon. Cancer Pharyngis et Œsophagi Læmoscirrhus, Dysphagia seu Læmostenosis scirrhosa; *Fr.* Cancer du Pharynx et de l'Œsophage; *Ger.* Krebs des Schlundes und der Speiseröhre, Schlundkrebs.

As the pharynx and œsophagus constitute but one canal, cancer of both may be considered under the same head, although it may be convenient to specify the symptoms of each.

Diagnosis.—The onset of cancer of the pharynx may be indicated by a slight uneasiness in the throat, which may be nothing more than a sense of tickling; but this gradually becomes painful; and the pain augments, and assumes a lancinating character; deglutition becomes daily more and more difficult; and, if the affection be seated high up in the pharynx, an irregular, fungous tumour may be perceived; the neck is now observed to be swollen and tender on pressure; the breath becomes offensive; and the patient expectorates a glairy, ropy, sanious, or puriform matter, which has a repulsive odour. As the swelling extends to the neighbouring parts, the voice becomes altered and raucous; and the pressure of the tumour upon the larynx and trachea may interfere materially with respiration, so as to threaten suffocation.

The local feelings in cancer of the œsophagus are much the same as in cancer of the pharynx, except that they are referred lower down.

The aliment, too, as the disease advances, accumulates above the narrowed portion of the tube, and creates a sense of weight and hiccough, until it is regurgitated. If the disease be seated in the cervical portion of the œsophagus, a hard, circumscribed, fixed, or movable tumour may be felt between the larynx, trachea, and the vertebral column. In both cases, there is the peculiar sallow tint of the skin, which is observed in the cancerous diathesis.

The progress of cancer of the pharynx and œsophagus is slow, but not the less certain. It is liable to exacerbations, which may be relieved by appropriate remedies; but the disease scarcely admits of cure; and, sooner or later, the patient dies, either from inanition, owing to the tube becoming entirely obstructed, or worn out by the pain, and by the accompanying irritative fever which never fails to be developed.

Pathological Characters.—The parietes of the tube are observed to be thickened, of a lardaceous character, gray, opaline, and semitransparent, creaking under the knife, or softened and encephaloid. In the neighbouring parts, small, red, fungous, and polypous excrescences are often met with, the centre and base of which are firm, and of a whitish appearance. At the seat of the cancer, the calibre of the tube is found diminished, almost obliterated; but immediately above it may be greatly dilated.

Cancer of the œsophagus, as well as of the pharynx, is sometimes observed to follow cancerous engorgement of the lymphatic glands, or of the surrounding cellular tissue, in females, who have undergone amputation of the breast for an affection of the same nature. Where the œsophagus is greatly dilated, and especially if the parietes have become softened by any morbid process, or perforated by ulceration, the contents of the canal may be poured into the posterior mediastinum, and death be the inevitable result. This constitutes the *Dysphagia à Rupturâ Œsophagi* of some of the German writers, cases of which are on record.

Treatment.—In addition to the regular use of the bougie, as recommended under stricture of the œsophagus, attempts may be made to break in upon the cancerous dyscrasy by such remedies as are calculated to modify the condition of the circulating fluid, and, through it, that of the whole system of nutrition. Of these, the preparations of iodine are the best, which should be given freely, either in the form of the tincture of iodine, (gtt. x. ter die,) gradually increasing the dose; in that of the solution of iodide of potassium, (gtt. x. ter die,) or of iodide of iron, (gr. iij. vel iv. ter die.) Either of these preparations may be taken in an ounce and a half of simple syrup. By some, mercurials have been advised, especially the corrosive chloride, (gr. $\frac{1}{16}$, ter die,) which may be given in the same vehicle: or a combination of iodine and mercury, in the form of red iodide of mercury, may be prescribed (gr. $\frac{1}{16}$, ter die,) taking care not to push the mercurials so far as to induce their wonted febrile and peculiar effects. Pain must be allayed by full doses of opium or of some of its preparations. Conium, stramonium, belladonna, and other narcotics, which were at one time highly extolled, have fallen into comparative disuse. They have been

proved to possess no power over the cancerous cachexia; and, as anodynes, they are far inferior to opium.

When deglutition cannot be readily accomplished by the natural efforts, food and medicine may be conveyed, for a time, into the stomach, by means of an œsophageal tube; and, if this plan should excite too much irritation, life may be prolonged, and ease be afforded, by throwing nutritive solutions, as soups, milk, &c., into the colon. Digestion—limited, it is true—takes place low down; and, there is no doubt, that, in such cases, the absorbents may, for a brief period, convey fresh matters into the blood, which may partly supply its losses; but no chance whatever can exist of any permanent advantage. At this late period, relief may be afforded by strong doses of opiates thrown up into the colon, or by the endermic use of the salts of morphia.

VII. Spasm of the Pharynx and Œsophagus.

Synon. Dysphagia, D. Spasmodica, D. Nervosa, D. Spastica, Strictura Œsophagi Spasmodica, Œsophagismus, Œsophagialgia; *Fr.* Spasme du Pharynx et de l'Œsophage, Ténesme de l'Œsophage; *Ger.* Schlundkrampf, Krampf des Schlundes und der Speiseröhre.

Without any evidence whatever of inflammation, and under certain conditions of the great nervous centres, the muscles of the pharynx and œsophagus contract spasmodically, so as to prevent any alimentary matter from reaching the stomach; and, at times, the action is so sudden and forcible, (in rabies, for example,) that the fluid is projected violently from the mouth. The affection, in this case, is seated in the nervous centres, which, as shown under Hydrophobia and Hysteria, are in an impressible state, so that, when any eccentric impression is made upon the lining membrane of the pharynx, it is conveyed to the nervous centres, whence it is reflected, with the rapidity of lightning, to the muscles, that give rise to the phenomena in question. The *globus* or *nodus hystericus*, the sense of a ball rising up in the throat, threatening suffocation, and impeding deglutition, is an example of this nervous dysphagia.

Treatment.—The plan of treatment recommended under Hysteria is the one demanded in this form of spasm. Narcotics and revellents must constitute the reliance of the practitioner. The affection almost always terminates favourably.

VIII. Paralysis of the Pharynx and Œsophagus.

Synon. Dysphagia Paralytica, D. Torpida, D. Atonica, Angina Paralytica, Asthenia Deglutitionis, Pharyngoplegia, Pharyngolysis, Paralysis Œsophagi, Gulæ Imbecillitas; *Fr.* Paralysie du Pharynx et de l'Œsophage; *Ger.* Lähmung des Schlundes und der Speiseröhre, Schlundlähmung.

This affection has been described as a distinct disease of the pharynx and œsophagus; but it is almost always, if not always, a symptom of general paralysis, or of some disease which is approaching a fatal termination. Its treatment, where treatment can be of any avail, is given elsewhere, under Paralysis. The application of galvanism—the zinc pole to the feet, and the copper pole to the larynx, sides, and base of the tongue, three or four times in the minute, and twice a day—has been found beneficial. It requires, according to Most, to be continued from five to six weeks.

CHAPTER III.

DISEASES OF THE STOMACH.

The arrangement of the coats of the stomach and of the intestines occasions their diseases to differ materially from those of the supra-diaphragmatic portion of the digestive tube. They are lined, it is true, with a similar membrane, but their muscular coat is much thinner, and, in addition, they have a reflection of the peritoneum, which lines the cavity of the abdomen. All these coats are liable to be implicated in disease, but the prominent affections are chiefly restricted either to the mucous or the peritoneal coat; the function of the muscular coat being generally more or less modified, but the structure itself not being materially implicated unless the organic mischief is considerable.

Exposed, as the stomach is, to the contact of various irritants, it is surprising, that it is not oftener affected with serious disease. With the most regular and temperate, its sensibilities must be variously affected by the different aliments received into it; yet, even in the intemperate, the impunity with which heating substances can be admitted into the organ, indicates a wonderful resistance to the action of morbific agents. Of late years, the attention of pathologists has been more directed to the condition of its lining membrane; and, although we may not embrace all the views of Broussais, who considered the gastro-enteric mucous membrane to be the *fons et origo* of most diseases, we cannot doubt, that morbid conditions of an inflammatory nature may exist, which may not be indicated by the ordinary signs of inflammation, and yet, by irradiation, may be the cause of much suffering, not only in the digestive apparatus, but elsewhere. If, consequently, we reject the exclusivism of Broussais, we must still retain much that is valuable of the labours of that eminent, but too enthusiastic teacher.

I. INFLAMMATION OF THE STOMACH.

Synon. Gastritis, Inflammatio Ventriculi, I. Stomachi, Phlegmone Ventriculi, Empresma Gastritis, Cauma Gastritis, Inflammatio Gastritis; *Fr.* Gastrite, Inflammation de l'Estomac; *Ger.* Magenentzündung.

Notwithstanding the constant exposure to various irritants, to which allusion has been made, the stomach is rarely affected with *acute* gastritis, either of the mucous or peritoneal coat; the *chronic* form is much more common. It may be well to consider them separately.

a. *Acute Inflammation of the Stomach.*

Synon. Gastritis Acuta, G. Phlegmonodes, Acute Gastritis; *Fr.* Gastrite Aiguë ou Phlegmoneuse; *Ger.* Hitzige Magenentzündung, acute Magenentzündung.

Under this term, different diseases have been described by different writers; so that much confusion prevails among them.

Gastritis of the peritoneal coat is certainly a very uncommon disease, and its symptoms do not vary materially from those of gastritis of the mucous coat,—*Esogastritis*, as it has been termed. *Endogastritis* is perhaps preferable, as we already have the term *Endocarditis* in common use, to designate inflammation of the lining membrane of the heart. The pathology and treatment of gastritis of the peritoneal coat are identical with those of peritonitis. Many of the German writers place gastritis chiefly in the muscular coat; but this is very different from the observation of most pathologists.

It has been maintained by Broussais, that idiopathic inflammation of the stomach never occurs except in connexion with a similar state of the small intestine; but, although it is true, that they are often coexistent, and that pure gastritis is rare, it nevertheless does occur alone.

Diagnosis.—Acute endogastritis, when violent, is announced by symptoms that cannot be mistaken. After the ordinary evidences of internal inflammation, as shivering followed by heat of skin, languor and lassitude, &c., a severe pain is experienced at the epigastrium, which extends to the back, along the duodenum, and ascends, at times, along the œsophagus, so as to be felt between the shoulders. The epigastric pain is increased by the slightest pressure, and by the depression of the diaphragm, so that inspiration becomes painful and distressing, and also on taking liquid or solid aliment, and during the retchings, which are often incessant, and aggravated by ingesta of all kinds. The patient complains of a burning heat in the stomach; and the nausea and retching are tormenting. The matters ejected consist of the fluids taken, mucus, bile, and often blood; but no relief is afforded by their evacuation. The thirst is unquenchable, and the desire for cold drinks unbounded; yet, immediately after fluid reaches the stomach it is returned. In the intense form of gastritis, the pulse is not developed as in many other internal inflammations: on the contrary, it is small and frequent. The disease generally runs its course with extreme rapidity, especially when it has been induced by any acrid or corrosive poison. It may terminate fatally in a few hours, or not until the lapse of two or three days, according to the intensity of the cause, and the severity of the symptoms. These are at times far from pathognomonic. In a case related to the College of Physicians of Philadelphia by Dr. J. M. Paul, extensive lesions, the results of inflammation, were found on dissection, which had been previously unsuspected.

It is important to bear in mind, that after unequivocal symptoms of gastritis have existed for some time, they may become masked by the supervention of encephalic or pulmonary mischief, which may attract the attention of the practitioner exclusively, although the primary gastritis may be in full force.

In milder cases of acute endogastritis, the symptoms are, of course, much less marked. A dull pain is felt in the epigastric region, which is not increased by slight pressure, but is augmented when food is taken, or when any sudden shock is impressed upon the body. Sometimes this pain is intermittent; but, more commonly, it is continuous,

although liable to occasional exacerbations. An uneasy feeling of pulsation and of tension is also experienced in the region of the stomach. The appetite varies: sometimes it is greater than natural, but most commonly it is impaired. The thirst is considerable, with dryness of the mouth, and redness of the tongue, which last symptom is present in almost all forms of endogastritis;—at times, the whole surface,—at others, the tip and sides, being of a vivid red; the papillæ, at the middle of the tongue, projecting like minute strawberries through the white coat covering it. The appearance of the tongue is indeed regarded, by some, as one of the most marked points of discrimination between endogastritis and gastritis of the peritoneal coat; but extensive observation has shown, that there is no constant ratio between the state of the tongue and that of the stomach: the tongue, as elsewhere remarked, is of more importance as a guide to the condition of the general system. Along with the above symptoms, vomiting of the food is a frequent concomitant.

The urine, in a case observed by Simon, was scanty, of an extremely dark red colour, acid, and formed a dull yellow sediment of urate of ammonia and uric acid; it exhibited all the characteristics of the urine of inflammation.

This milder form of acute gastritis generally terminates by resolution, or it may pass into the chronic state.

Causes.—The most common causes of acute endogastritis are,—mechanical injuries, produced by wounds, or the swallowing of hard and pointed substances, corrosive and acrid poisons, &c. It may also arise like other internal inflammations.

Pathological Characters.—Since the attention of observers has been directed more closely to the condition of the mucous membrane of the stomach in disease, its varying characters have been depicted; and there is no doubt, that many appearances have been pointed out as pathological, which had no connexion whatever with the disease to which they were referred. It is important, consequently, to be acquainted with the healthy appearance of the mucous membrane of the stomach;—a point which has engaged the attention of numerous inquirers. From the result of their observations, as well as from those of discriminating and unprejudiced pathologists, it is found that not only hyperæmia may exist in the vessels of the stomach—*gastrohæmia*—without the organ being diseased, but that the coats of the stomach may be found corroded, and even perforated; yet the whole phenomena may have been cadaveric,—in the case of hyperæmia, some mechanical impediment having existed to the return of the blood of the veins of the portal system; and in that of corrosion and perforation of the stomach, the gastric acids contained in it, and which are without action on the living tissue, having exerted their chemical agency on the coats, as soon as they were deprived of vitality, in the same manner as they do on other dead animal matter.

In the healthy state, the mucous lining of the stomach has a white, slightly rosy hue over every part of its surface. It rarely happens, however, that there has not been some mechanical or cadaveric cause of hyperæmia, which has interfered with the circulation along the

portal veins, so that the mucous membrane does not often present the same homogeneous appearance; and these appearances may not always be readily appreciable from those of positive inflammation. On the other hand, in the case of hyperæmia of the stomach, as in the same condition elsewhere, there may be no appearances whatever on dissection, even when it has existed to a great extent; but, as inflammation includes modification of structure, careful examination can scarcely fail to detect it.

In the anatomical evidences left after the taking of poisons, we have an opportunity for noticing the organic changes that result from endogastritis. Redness is always perceptible. This may be partly or wholly caused by arborescent vascularity, to which the term "arborization" has consequently been applied, or by a dotted redness occupying various portions of the mucous membrane. Softening of the mucous coat is likewise met with in different degrees, as well as ulcerations, which, however, are less frequent than redness. Gangrene is likewise observed at times, and modification of the secretions, —as exhalation of blood, increased quantity of mucus, the formation of false membranes, &c. Many of the poisons coagulate albuminous matters, that may be present in the stomach; and certain of them, as the strong mineral acids, occasion contraction of the viscus. Generally, the mucous membrane alone is affected; but, if the poison has been active, and has remained for some time in the organ, the other membranes may become implicated, injected, softened, ulcerated, and even perforated. Such being the symptoms induced by corrosive and acrid agents, we can understand, that endogastritis, caused in any manner, may have similar necroscopic appearances,—as redness, softening, ulceration, gangrene, perforation, with modification of the secretions. There is reason, too, to believe, that inflammation of the mucous membrane of the stomach may be attended with eruptions in the same manner as the skin. Of this, however, farther mention will be made under Enteritis.

Careful examination of any portion of the inflamed mucous membrane exhibits it to be opaque; and, under the microscope, the opacity is found to result from changes that have occurred in the very system of nutrition. This is well seen, too, when a portion of the membrane is placed in a strong solution of chloride of sodium, which reddens the blood that may be present in the intermediate system of vessels. No ablution will be found to remove the appearances of inflammation.

Irregular, slate-coloured patches are often seen on the examination of persons who have died with broken down constitutions, especially in such as have had hepatic disease, induced by hard drinking. These slate-coloured appearances, on careful examination, have seemed to result, at the time of dissolution, from the impeded return of the venous blood through the liver to the heart, from the softened tissues constituting the parietes of the blood-vessels of the stomach, and from the thin condition of the blood. Under these circumstances, the blood readily transudes through the vessels into the submucous cellular tissue, and gives rise to the arborescent slate colour above mentioned.

Treatment.—In violent endogastritis, an active, sedative treatment

must be employed. Blood-letting, pushed so as to make a decided impression upon the system, but short of inducing syncope, is the main remedy; and, after the amount of the circulating fluid has been reduced sufficiently in this manner, leeches may be applied over the epigastric region, with the view of exciting a joint sedative and revellent action. When the leeches drop off, warm fomentations may be applied, and, subsequently, a large emollient poultice, if the weight of it be not inconvenient. Should this be the case, a flannel bag, half filled with chamomile flowers, or with hops, may be applied heated, and renewed at intervals. Cupping is equally efficacious with leeches, where tenderness on pressure will admit of it.

As the excessive vomiting, which accompanies the disease, is merely a symptom of the inflammation, it must be removed by taking away the cause. Still, it may be allayed, at times, by small quantities of soda water, taken ice-cold, or by small pieces of ice suffered to melt gradually in the mouth. Slices of orange, cooled by ice, are extremely grateful and beneficial in the same case. Revellents, applied to the lower part of the alimentary canal, as the ordinary domestic enema, or even cold water thrown up into the colon, will occasionally afford relief, when other agents have not succeeded. In milder degrees of the same affection, blood-letting may not be demanded, either generally or locally; cool, emollient drinks, abstinence from all solid aliments, pediluvia—simple or sinapised—with simple enemata to keep the tube free, and emollient or sinapised cataplasms to the epigastrium, may be all that is required.

It need scarcely be said, that, where the gastritis is owing to any acrid or corrosive ingesta, they must be removed, if they are still present in the stomach, either by titillating the fauces, or by the stomach tube or pump; and that, in all cases of convalescence from acute gastritis, the greatest caution, as to diet, must be inculcated. Farinaceous food, with milk, where the latter agrees, should be employed, until all risk of recurrence has passed away.

Relapses, in cases of gastritis, and, indeed, of most diseases, are commonly owing to errors in diet.

b. *Chronic Inflammation of the Stomach.*

Synon. Gastritis Chronica, G. Lenta, G. Erysipelatodes, Chronic Gastritis.

The various forms of dyspepsia have been regarded, by some, as nothing more than chronic endogastritis. It is by no means proved, however, that inflammation of the mucous membrane is always present; and, accordingly, by many, dyspepsia is considered separately as a neuropathic disorder. It is important, indeed, to bear in mind, that many cases of chronic gastritis have been mistaken for atonic dypepsia, and treated, accordingly, by tonics and excitants, with obvious and marked disadvantage. Careful examination will generally lead to a satisfactory discrimination, or, at least, induce a wise caution.

Chronic gastritis may supervene on the acute; but frequently, from the first, there are no signs of the acute form.

Diagnosis.—In place of acute pain — increased greatly on the

slightest pressure, as in acute gastritis—the most prominent symptom may be a sense of weight, or as if some solid body were placed behind the xiphoid cartilage. This feeling is usually constant, and distressing from its endurance rather than from its severity. The appetite is impaired, and a nauseous or bitter taste is experienced; the mouth is clammy; the tongue commonly foul, especially on rising; the digestion morbid; in short, the usual symptoms are those, which are commonly referred to dyspepsia;—flatulence, with a sense of distension after only a small quantity of aliment has been taken; nausea, and sometimes vomiting; the bowels generally torpid, unless the lining membrane of the intestines participates in the same diseased condition, when they may be looser than customary. The skin is usually hot, and the pulse frequent. These symptoms may persist for a long while, without injuring the general health; but, sooner or later, unless the inflammation be removed, the whole system of nutrition is affected; and partly owing to defective chylosis, and partly to the constant irritation, the individual loses all mental and corporeal energy, and dies in a state of atrophy, frequently with all the symptoms of pulmonary consumption.

Causes.—The most common cause, perhaps, of chronic gastritis is the intemperate use of fermented, and especially of alcoholic liquors: hence, the disease is very common in our eleemosynary institutions. The habitual use of any excitant substance is calculated to induce it. In like manner, it may be caused by aliments that disagree with the individual, as sour wines, improper food, both as regards quantity and quality, &c.

Pathological Characters.—These are necessarily of the same nature as in acute gastritis, but less marked. There may be but little redness; on the contrary, the lining membrane may be unusually pale, and yet this may be unquestionably a pathological state. At times, the membrane presents a slate-coloured appearance; but this, as has been already remarked, may not always be morbid. Thickening and softening of the mucous membrane are often witnessed; and, when it is thickened, the capacity of the stomach is encroached upon. Hypertrophy has, indeed, been considered one of the most striking characters of chronic mucous inflammation. It may be confined to the villi, producing velvety or fungoid elevations, or to the follicles, giving the appearance of warts or patchy excrescences. Ulcerations may be present, but they are not common. Their appearance varies. They are frequently surrounded by a circle of inflammation. When the mucous membrane is softened, it is often easy to scrape it off with the back of a scalpel. Frequently, in these cases, worms—ascarides lumbricoides—are met with in the stomach. They have, indeed, been regarded by Broussais as the products of the gastro-enteritis; but it will be seen, hereafter, that there is no sufficient ground for this belief. By others, the gastritis has been ascribed to their presence, but the idea is probably equally unfounded.

Treatment.—In the treatment of gastritis of the chronic form, the main reliance has to be placed on revulsives, accompanied by appropriate diet. Cups or leeches may be applied occasionally to the pit

of the stomach. In other cases, a blister to the same region, or the application of the ointment of tartarized antimony, or of a few drops of croton oil, rubbed on the epigastrium—a piece of lint or bladder being interposed between the finger of the rubber and the skin of the patient—affords essential relief. Frequently, however, all treatment fails in removing the disease, until the patient is subjected to that thorough change in all the physical and moral circumstances surrounding him, which is advised under Dyspepsia.

The diet must be regulated in the same manner as in that disease; all highly stimulating aliments being avoided, and care being taken both as regards quantity and quality. Whenever the lining membrane of the stomach is inflamed, the secretion of the gastric juice is interfered with; and, consequently, if food were taken, inasmuch as none of the gastric solvent is present in the stomach, it could not fail to act as an irritant.

II. GASTRORRHŒA.

Synon. Blennorrhœa Ventriculi; *Fr.* Gastrorrhée, Flux muqueux de l'Estomac; *Ger.* Blennorrhöe des Magens, Magenkatarrh.

It has been presumed, that the mucous lining of the stomach, like the mucous membranes in general, may be affected with *catarrh*, using the term in the extensive signification in which it is employed by the French practitioners; and there can be no doubt that, under inflammatory irritation, the secretion may be greatly augmented; but whether any such distinct affection as the pulmonary or vesical catarrh exists, characterized by symptoms that cannot be mistaken, has been a question with pathologists; some believing, that any increased exhalation is the result of chronic gastritis, of incipient cancer, or of an affection in a remote organ, and that it is very rarely idiopathic; whilst others think, that, although gastrorrhœa has been confounded with gastritis, its separate existence is demonstrated, and that it ought to have a distinct place assigned to it.

The ordinary catarrhs from mucous membranes are inflammatory; but the *Stomachal catarrh*, of the French writers, is looked upon as a disease not dependent upon inflammation. On inspection after death, it is affirmed, the mucous membrane of the stomach is found to be covered by a thick layer of mucus, without there being any signs of inflammation of the membrane. The symptoms, too, are different from those of gastritis, and the treatment diametrically opposed to it. M. Andral properly remarks, however, that gastrorrhœa may exist along with chronic gastritis, or be a consequence of it, as the ordinary gleet is the result of a previous inflammatory condition. The diagnosis, he admits, is sometimes difficult; but still, he thinks, if an attentive examination be made, the simple flux of the mucous coat cannot be confounded with gastritis: but, if doubts exist, the treatment will remove them: this, indeed, he considers the real touchstone.

It can scarcely be questioned, that, as in the case of the system of nutrition when hypertrophy exists, a nutritive irritation may be present in the secretory system, which may differ materially from inflammation, and give occasion to inordinate secretion; and that such

may be the case with the mucous follicles of the stomach. Under this impressibility, particular agents may augment the other secretions, as we know they augment the secretion of the gastric acids. Gastrorrhœa, for example, is stated to be increased by mucilaginous drinks: the secretion of the gastric acids is increased by weak saccharine solutions: and many other articles of diet are productive of similar results.

The form of gastrorrhœa with which we are most familiar is that commonly described by pathological writers under the name of *Pyrosis,—Limosis cardialgia sputatoria, Cardialgia sputatoria, Apocenosis vomitus pyrosis, Dyspepsia pyrosis, Waterbrash, Waterqualm;* Ger. *Sodbrennen;* which is generally considered to be one of the manifestations of dyspepsia. It often accompanies chronic gastritis, and other affections of the stomach, and is characterized by a copious eructation of watery fluid, usually insipid, but at times acrid, with a sense of weight and often of burning pain extending over the epigastrium. In some persons, the secretion is so copious, that they can eject at pleasure considerable quantities, especially in the morning before taking food, or they possess what has been termed the faculty of *vomiting at pleasure.*

It has been suggested by Dr. Burne, and with much plausibility, that the fluid of pyrosis does not proceed from the stomach, inasmuch as when that organ is full from a preceding meal, some of the food ought to be thrown up with it. He is disposed to refer it to the salivary glands and muciparous follicles of the mouth and throat; and he elucidates the matter by a reference to the fact, that when an emetic is taken, and the person first feels sick, the mouth instantly fills with water, which runs from it in a clear stream: after this, vomiting of the contents of the stomach ensues. The clear fluid is furnished by the salivary glands and muciparous follicles of the mouth and throat, suddenly excited to inordinate secretion by sympathy with the disordered stomach;—phenomena, which, in Dr. Burne's judgment, form an exact parallel to the nausea of pyrosis, and the sudden discharge of the limpid fluid. In the vomited fluid, a microscopic cryptogamic plant has been found, called by Mr. Goodsir *Sarcina ventriculi*, with acetic, lactic, and carbonic acids. In every instance, in which the sarcina was examined, the animalcules presented themselves in the form of square, or slightly oblong plates, of a pale-yellow or brown colour, and varying in size from the 800th to the 1000th of an inch. They were made up of cells, the walls of which appeared rigid, and could be perceived passing from one flat surface to another as dissepiments. These dissepiments, as well as the transparent spaces, were from compression of contiguity, rectilinear, and all the angles right angles; but the bounding cells bulged somewhat irregularly on the edges of the animalcule by reason of the freedom from pressure. These circumstances gave the whole organism the appearance of a woolpack, or of a soft bundle bound with cord crossing it four times at right angles, and at equal distances. From these peculiarities it was termed by Mr. Goodsir *Sarcina* ('a pack, a woolpack.')

It has been affirmed, by Dr. Symonds, that the cause, which, more

than all others, induces this affection, is the exclusive use of farinaceous and vegetable food, especially when combined with alcoholic drinks: "hence, its frequency in Scotland and Ireland, where oatmeal and whiskey, or potatoes and the same liquid, are the meat and drink of a large portion of the poorer classes of the population."

Treatment.—Agents, that gently stimulate and induce a new action in the stomach, are found to be most efficacious. Of these, emetics are perhaps the best. Under the influence of an emetic, gastrorrhœa, which has persisted for two or three weeks, has disappeared in the course of twenty-four hours. The ordinary emetic of tartrate of antimony and potassa and ipecacuanha is as good as any that could be prescribed. The emetic may be followed by a brisk cathartic of calomel and jalap, or by any of the active cathartics, which, by exciting a revellent operation on the intestinal canal, detract from the disorder of the stomach. The cathartics may be repeated twice a week if necessary. Along with this plan, a tonic system must be adopted, similar to that advised under dyspepsia. The subnitrate of bismuth and the nitrate of silver, given as advised under Gastrodynia, have been especially extolled. Sir James Eyre and Mr. Lane have highly recommended the oxide of silver. Sir James prescribes it in half-grain doses, three times a day, and affirms, that "it will prove more effectual in its cure than any medicine which has been yet employed." As costiveness often exists, he advises the following cathartic pill.

℞.—Extract. colocynth. comp. ℈ij.
———hyoscyami ℈j.—M. et divide in pil. xij.
Dose, one or two every night.

The diet should be dry, and easy of digestion.

Some of the cases of what have been termed "*Alkaline indigestion*," and "*Neutral indigestion*," would appear to have been gastrorrhœa. The fluids, brought up by some of those who have the power of *vomiting at pleasure*, instead of being acid, have been looked upon as alkaline. Whether this be really the case or not, we can readily understand, that there may be a deficiency of acids secreted from the stomach, as we know there frequently is a redundancy. In these cases of "alkaline indigestion," acids, as the muriatic, (gtt. vj.—x. ter die ex aquâ,) have been found very beneficial, along with appropriate general management. (See Dyspepsia and Chronic Gastritis.) Of late years, lactic acid—presumed by some to be one of the gastric acids—has been strongly advised by Magendie, in the form of lemonade.

℞.—Acid. lact. liquid. f ℥j.—℥iv.
Aquæ Oij.
Syrup. f ℥ij.—M.

The researches, however, of Liebig, would seem to show, that this acid never exists in the healthy stomach; and he affirms, that the property possessed by many substances, such as starch, and the varieties of sugar, by contact with animal matters in a state of decomposition, of passing into lactic acid, has induced physiologists too hastily to assume the fact of the production of lactic acid during healthy digestion; but this point of organic chemistry cannot be regarded as by any means settled.

III. SOFTENING OF THE STOMACH.

Synon. Gastromalacia, Dissolutio Ventriculi, Emollitio Ventriculi, Malaxis Ventriculi, Pseudophlogosis Ventriculi Resolutiva et Colliquativa, Metamorphosis Ventriculi Gelatiniformis; *Fr.* Ramollissement de l'Estomac, Gastromalacie; *Ger.* Magenerweichung, Erweichung de Magenhäute, Gallerartige Magengrunderweichung.

Under the head of Gastritis reference was made to softening of the stomach as one of the consequences of inflammation, but the attention of pathologists had not been largely directed to it prior to the observations of M. Louis. The disease has been described, by some, as peculiar in its character, and not as a form of chronic gastritis. It seems to us to belong manifestly to the latter, but it may still demand a separate consideration.

Diagnosis.—The following symptoms have been considered to characterize this inflammation. Long protracted disorder of the functions of the stomach, commencing, in the first instance, with fever, nausea, vomiting, loss of appetite, constant *epigastralgia*, and after persisting, either continuously or with some remissions, terminating in death. When these symptoms supervene in the course of a chronic disease, and especially in phthisis, and when they have continued for twenty days, six weeks, or two months, and at the same time there is neither a tumour at the epigastrium nor any sign of cancer of the stomach, the diagnosis may be regarded as more positive.

Softening of the mucous membrane of the stomach is a very common appearance in the fatal cases of dropsy and visceral diseases, which occur annually in our eleemosynary hospitals, in persons who have been long addicted to the abuse of spirituous liquors. In many such cases, there may have been no symptoms, which enabled the observer to pronounce as to the character of the lesion, except the ordinary symptoms of chronic gastritis.

In children, a gelatinous or gelatiniform softening of the mucous lining of the stomach (*Gastromalacia Infantum;* Fr. *Ramollissement Gélatiniforme*), was first pointed out by M. Cruveilhier. It is indicated by the ordinary signs of severe gastritis—as pain and tension in the epigastrium; the contents of the stomach, mixed with bile, discharged by vomiting, either immediately or a long time after food has been taken; countenance always expressive of suffering, with great restlessness. To these symptoms succeed general prostration and stupor, and the child sinks in the course of from a week to a fortnight.

It is proper to bear in mind, that, although the softening of the stomach is generally produced by an inflammatory process, it may result likewise from the action of the gastric acids after death. This has been unquestionably established by experiments on healthy animals, and by the observation of many eminent pathologists.

Pathological Characters.—Gelatiniform softening usually occupies, more especially, the splenic portion of the stomach; and is at times to such an extent as to resemble jelly, whence the epithet given to it. The parts thus affected, are devoid of colour, transparent, apparently inorganic, being devoid of vessels and nerves, and exhale a sourish odour. M. Cruveilhier has also observed a black colour of the vessels in the vicinity of the softened parts. He considers the

perforation of the stomach, and the escape of the matters contained in that organ, which are occasionally witnessed, to be cadaveric phenomena, inasmuch as in none of the cases were there evidences of peritonitis.

In simple softening, the mucous membrane of the stomach is found in some parts so much softened, that it can be removed by scraping it with the back or the handle of a scalpel. It is generally pale, semitransparent, reduced to great tenuity, and occasionally wholly destroyed—the membrane being, at times, rose-coloured, or grayish, and studded with reddish or blackish spots. The softening is most frequently met with at the cardia, the pylorus, and the *bas-fond* of the stomach, but the whole of the mucous membrane may be implicated. The other coats of the stomach are generally healthy. When the mucous membrane is destroyed in places, the denuded spots are not regularly defined, as is often the case in ulcerations of the same membrane.

This form of softening frequently occurs in persons suffering from some chronic malady, and especially from phthisis; in which disease M. Louis met with it in one-fifth of observed cases.

Treatment.—Although it has been conceived to be practicable not only to diagnosticate the existence of gastromalacia, but likewise to arrest its disorganizing progress, it is a question, whether, if detected, great advantage is to be derived from any plan of treatment. Milk diet, baths continued for a long time, and the properly regulated use of opium, have been regarded as the curative agents by some,—antiphlogistics and derivatives, they assert, enfeebling the patient without mitigating the disease. They, on the contrary, who believe the affection to be essentially inflammatory, and who treat all inflammations by the rigid antiphlogistic rule, apply leeches and derivative or emollient cataplasms to the pit of the stomach. The practitioner will have to form his judgment from the nature of the particular case, always taking care not to introduce agents into the stomach, which, by their excitant properties, may add to the mischief already existing. The intestinal canal should be kept clear daily by means of enemata.

IV. PERFORATION OF THE STOMACH.

Synon. Gastrobrosis, Perforatio Ventrieuli, Gastrorrhexis; *Fr.* Perforation de l'Estomac; *Ger.* Durchlöcherung des Magens, Magendurchborung.

It has already been remarked, that perforation may be the result of the action of the gastric fluids on the stomach after death. Under morbid conditions, also, the organ may be torn or give way, and the alimentary matters be effused into the cavity of the peritoneum, or it may yield in the direction of the cavity of the omenta; and, if adhesions have taken place between the stomach and the diaphragm or intestines, an opening may be formed into the chest or bowels.

Perforation of the stomach is usually—some say always—a sequel of inflammation of the mucous coat of the organ ending in ulceration—*Gastrelcosis*, Ger. *Magenverschwärung*. This ulceration may either be simple in its character, or malignant, and in both cases may be accompanied by hectic fever and wasting—*Gastrophthisis*, Ger. *Magenschwärsucht*.

Diagnosis.—Excruciating pain suddenly occurs at the epigastrium, with a sensation of burning heat, which spreads over the whole abdomen; the patient rolls about in all directions; loses consciousness, and makes perpetual, but ineffectual, efforts to vomit; the features become changed and hippocratic; the pulse small and frequent, and the respiration anxious; meteorism succeeds, and death in the course of a few hours.

Treatment.—This can only be palliative. It is scarcely necessary to say, that, when the diagnosis is accurately established, no expectation of cure can be indulged. The efforts of the physician must be directed to a euthanasia, by the use of anodynes in full doses.

V. DILATATION OF THE STOMACH.

Synon. Dilatatio Ventriculi, Gastrectasis, Gastraneurysma; *Fr.* Dilatation de l'Estomac; *Ger.* Erweiterung des Magens, Magenerweiterung.

The affection of the stomach, described under this name by M. Grisolle, corresponds, he conceives, to the affection termed by the older writers *Hydrogastrie* or *Hydropisie de l'Estomac.*

Diagnosis.—As dilatation of the stomach almost always coexists with cancer of the pylorus, the symptoms of that disease will generally be present. In addition, however, there will be phenomena indicative of dilatation of the organ,—such as manifest gurgling or fluctuation produced when the trunk is suddenly moved. This may be present, however, in healthy persons soon after fluid has been taken. When percussion is practised over the epigastric region, and the whole of the upper part of the abdomen, a clear tympanitic sound will be rendered, if the patient be in the erect attitude; but this diminishes as the lower portions are approached, owing to the accumulation of the fluids there, which necessarily gives a more and more flat sound. By placing the patient in the horizontal posture, the sounds are of course modified. Generally, an uncomfortable sensation of constraint is experienced in the abdomen, where no tumour can be discovered, unless a complication with cancer of the pylorus exists, and not always then. The digestive function is more or less disturbed; the vomited matter is watery and alimentary; and often exceeds the quantity which an ordinary sized stomach would be capable of containing. In proportion as the stomach becomes dilated, the vomiting is less frequent, owing to the organ being necessarily more and more enfeebled.

Pathological Characters.—The stomach sometimes forms an enormous pouch, which covers the whole mass of intestines, and may even descend into the pelvis. The organ may be enlarged generally, or the great *cul-de-sac* alone may be affected. It may acquire five or six times its ordinary size; and a case is cited by M. Grisolle of its containing ninety pounds of liquid. In almost all cases, the pyloric orifice has been found greatly narrowed, and owing to this circumstance the food and secretions accumulate, and are retained in the viscus, and dilatation is effected mechanically,—the parietes of the stomach being at times greatly diminished in thickness, and occasionally perforated where they are thinnest.

Treatment.—Where the dilatation is connected with, or owing to, scirrhus of the pylorus, the prognosis and treatment are the same as in the primary affection. Where the dilatation is simple—a very rare occurrence—it has been recommended to endeavour to arouse the contractility of the organ by compression and counterirritants; with tonics, excitants, strychnia, &c. internally: but these and all agents will generally prove unsuccessful.

VI. CANCER OF THE STOMACH.

Synon. Induratio seu Scirrhus seu Cancer seu Carcinoma Ventriculi, Gastrostenosis Scirrhosa, Gastroscirrhus; *Fr.* Cancer de l'Estomac; *Ger.* Magenscirrhus, Magenkrebs, Magenverhärtung, Skirrhöse Magenverhärtung, Karcinomatöse Magenschluss.

Cancer of the stomach occurs most frequently in the pyloric portion. It may, however, attack both the anterior and posterior surfaces of the viscus, the cardia, and the great and little curvature.

Diagnosis.—In the first instance, the symptoms cannot be distinguished from those of chronic gastritis. Generally, a shooting pain is felt, sooner or later, in the epigastric region; although, in other cases, the sensation is merely that of weight. Digestion is always impaired, —the patient experiencing more or less distension after eating even a small quantity of aliment, and being distressed by acid eructations. Vomiting is a common symptom; and, if the carcinomatous affection be seated at the cardia, it supervenes soon after eating. On the other hand, if the malady be at, or near, the pylorus, it may not occur until the lapse of an hour, and then the new food may be apparent amongst the rejected matters along with the food that may have been taken a day or two previously. When the vomiting occurs in the fasting state, it may consist of mere mucus, or blood exhaled from the mucous coat, which has preserved its natural character, or become more or less modified in its appearance whilst present in the stomach. Towards the last periods of the disease, sour chocolate-coloured matters are generally discharged by vomiting—often in enormous quantities—and in all cases, the rejection of the contents of the stomach affords temporary relief. When these chocolate-coloured matters are subjected to microscopic examination, they are found, according to Remak, to consist, for the most part, of yeast plants. In one case, the fermentation was accompanied by a well-marked development of gas, and there was a manifest separation of the yeast into an upper and a lower stratum.

In many cases, examination of the epigastric region throws no light on the disease; but, in others, a tumour, which is movable according to the position of the stomach, can be felt through the parietes of the abdomen. In a case of scirrhus of the pylorus, under the author's care, which went through all its stages tardily, and ultimately proved fatal, no tumour whatever could be felt in any part of the epigastrium. In certain cases of great diminution of the pyloric orifice, the outlines of the stomach are perceptible behind the extenuated parietes of the abdomen, and can be readily followed by the hand; and by shaking the patient, and applying the ear at the same time to the epigastric region, the sound of gurgling may be heard. The outlines of the stomach were most distinct in the case above referred to.

In the majority of instances, the patient presents the peculiar sallow hue and the general phenomena of cancerous affections; and cancer of the stomach is rarely met with except at periods of life, which are most prone to those affections. It has been doubted, however, by Dr. Stokes, whether there be any validity in the distinction between this and common ulceration in various other parts. In many cases, certainly, a question may arise as to the existence of any true cancerous *vice* in the system; but, undoubtedly, others do occur in which such *vice* exists, and a local transformation is found in the stomach possessing the malignant and incurable character of cancer when seated elsewhere. The diagnosis is obscure; for cancer of the stomach may unquestionably exist without any pathognomonic signs. The dark-coloured matter vomited, and the epigastric tumour, if not absolutely pathognomonic, are properly regarded by M. Grisolle as of great diagnostic value.

Most commonly, the disease is attended with constipation; but there is rarely much disorder in the other functions, until it has laid fatal hold of the system. The termination is often long delayed by intermissions, during which the patient feels so well as to lead to the belief, that he is about to recover; but, sooner or later, the morbid phenomena recur. There are cases, however, on record, in which cancerous tumours have existed in the stomach, in a quiescent state, for years.

Causes.—These are no more known than are those of cancer in general. A cancerous diathesis constitutes the predisposition, which may be developed by various causes—amongst which has been reckoned, by M. Andral, the habit of drinking ardent spirits when fasting. It would seem to be unquestionable, that the predisposition may be communicated by hereditary organization. The disease is most common between the ages of thirty-five and sixty.

Pathological Characters.—When the scirrhus or cancer is seated at or near the pylorus, so as to constitute an obstacle to the passage of the chyme into the duodenum, the stomach is generally enlarged, and usually filled with a dark-coloured fluid, both when the viscus is ulcerated and when it is not. The affected part is thickened and indurated, and, when an incision is made into it, creaks under the scalpel; it is of a white, grayish, pearly, opaline appearance, semitransparent or opaque, or yellowish. The coats of the stomach become so involved, that no appearance of them exists, except the peritoneum, which may remain sound until the last. The consistence of the tumour, which has often a lardaceous character, is less towards its centre, where the softened portion has at times the appearance of encephaloid transformation. The thickness of the morbid part varies from two lines to half an inch or more, and its internal surface is irregular, ulcerated, and covered with a whitish gray, or blackish fungous matter; in the intervals of which there are numerous depressions. The odour exhaled from it is often repulsive. The interior of the stomach is frequently studded with red, polypous vegetations.

Treatment.—The essential treatment must be that of cancer in general;—iodine, for example, and the other agents that are adapted

for modifying the condition of the circulating fluid, and through it that of the system of nutrition: the acid eructations may be palliated by the bicarbonate of soda, or by magnesia; and, if the latter should be insufficient to remove the constipation, which is usually present, emollient enemata may be administered. When the scirrhus is seated at the pylorus, the entrance into the duodenum becomes at times so restricted, that the chyme can pass only in small quantity through it. Nourishing soups or milk may, in these cases, be injected into the colon by means of the rectal tube of Dr. O'Beirne, and life may be prolonged for a short time in this manner.

The severe pain that accompanies the disease must be palliated by opium or its preparations. Some have preferred conium, hyoscyamus, stramonium, or belladonna, partly because they have been presumed to possess eutrophic or alterative powers—which, however, is more than doubtful—and partly because they are not attended with the objection that applies to opium,—of exerting a constipating action; but, after all, the patient is usually compelled to abandon them, and to seek relief from opiates.

Revellents—as blisters, cupping, or leeching—have been applied to the epigastrium, but the relief derived from them has been trifling, whilst certain of them tend to increase the debility. The belladonna or opium plaster to the epigastrium is occasionally beneficial. As a general rule, milk diet is most appropriate; but, should this disagree, the farinaceous preparations—as arrow-root, or sago, or animal broths—may be substituted. Frequently, tender meat will be digested; and, where this is the case, it may be allowed, with boiled rice.

VII.—HEMORRHAGE FROM THE STOMACH.

Synon. Hæmorrhagia Hæmatemesis, Hæmatemesis, Vomitus Cruentus, Vomitus Sanguinis, Hæmorrhagia Ventriculi, Gasterorrhagia, Gastrorrhagia, Gastrohæmorrhagia, Vomiting of Blood; *Fr.* Hématémèse, Vomissement de Sang; *Ger.* Blutung des Magens, Magenblutung, Magenblutflus, Blutbrechen.

Hæmorrhage from the stomach is not an unfrequent occurrence, and, when independent of disease in some other organ, is not a very serious affection: generally, however, it is symptomatic, and the prognosis consequently merges in that of the primary malady.

Diagnosis.—Commonly, before any blood is discharged from the stomach, the patient experiences signs of concentration of action towards some internal organ, with others peculiar to the stomach itself. Often, the uneasy sensations commence with chilliness, and a feeling of heat or distension of the epigastric region: the face is, at the same time, pale, and the extremities cold. Manifest distension now occurs in the epigastrium, with a sense of weight; and a sweetish taste is experienced, followed by nausea and vomiting—usually of a large quantity of blood. As the blood may have been progressively accumulating in the stomach, and become mixed with the gastric acids and the other contents of the viscus, it is almost always black, and often grumous.

The only affection with which hæmatemesis can be confounded is hæmoptysis; yet, as will be shown hereafter, there is a marked difference between them,—both in the symptoms, which are referred, in one

case, to the epigastric, and, in the other, to the thoracic region; and in the appearance of the blood evacuated, which in hæmatemesis has the characters described above, whilst in hæmoptysis it is florid and frothy. Difficulties may, however, arise occasionally, as where pulmonary symptoms have previously existed, and, subsequently, vomiting of blood occurs. A case of this kind fell under the author's care. A man was received into the wards of the Philadelphia Hospital, labouring under general dropsy, with signs of cavities in the lungs, and the ordinary functional phenomena announcing their presence. In the absence of the attending and resident physicians, he was suddenly seized with a copious discharge of blood from the mouth, of a dark, grumous character, and expired before the resident physician could reach the ward. At first, it was supposed, that the hemorrhage proceeded from the lungs, but the character of the blood referred the affection to the stomach; and that such was the fact was proved by dissection. It rarely happens, that hæmatemesis is thus rapidly fatal; it may recur, indeed, again and again; and where it is dependent upon any irregularity of the menstrual function, it may return periodically, and ultimately disappear. Occasionally, the blood accumulates in the stomach, and gradually passes into the bowels, whence it is evacuated. The quantity discharged is rarely less than ten or twelve ounces; but at times it amounts to upwards of three pints.

Causes.—Blows received on the epigastric region, or sharp substances passed into the stomach, may occasion the disease; but this is not usual. Hyperæmia may likewise take place in the vessels of the stomach under inappreciable circumstances; and, occasionally, the transudation of blood would appear to depend upon active gastritis—the vomiting of blood being accompanied by epigastric tenderness, heat of skin, and general febrile excitement. At other times, the cohesion of the coats of the stomach may be lessened, so that the vessels are more loosely protected, and, therefore, more readily admit of distension; hence, transudation of blood occurs, especially if the parietes of the vessel participate in the softening. We can thus understand, that hæmatemesis may be a symptom of softening, of perforation, and of cancer of the stomach. In the two last diseases, a vessel may be perforated, and death take place suddenly, in consequence of the copious discharge.

In females, whose catamenia have never appeared, or been arrested, hyperæmia of the vessels of the stomach, with hemorrhage by diapedesis, may occur monthly, without the existence of any pathological condition, either of the parietes of the vessels, or of the mucous membrane of the stomach.

Where the constitution of the blood is modified, and its solid portions are diminished in proportion—as in purpura, typhus, and every form of anæmia or oligæmia—especially as this state is accompanied with impaired nutrition and diminished cohesion of the solid parts of the body, transudation of blood may take place from the vessels of the stomach as from other vessels; and hence hæmatemesis—like petechiæ, vibices, &c.—becomes a symptom of purpura, typhus, &c.

Where hæmatemesis is caused by softening, perforation, or cancer

of the stomach, the history of the previous symptoms will throw sufficient light on the pathology of the disease.

Hæmatemesis is often, also, symptomatic of diseases of other organs. Whatever interferes with the circulation of the blood, especially in those whose blood is more fluid than in health, or whose system of nutrition is impaired by disease, may give occasion to hæmatemesis. Accordingly, we observe it in those who have resided long in malarious regions, and suffered more or less under malarious disease—as enlargement of the liver or spleen. It may, in like manner, be symptomatic of disease of the heart. Whatever impedes the return of blood along the portal system towards the heart, may occasion hyperæmia in the vessels of the stomach, and consequent hemorrhage.

It may be remarked, that blood is occasionally discharged from the stomach, which does not proceed from the vessels of that viscus. In cases of epistaxis, if the person remains upon his back, the blood may not flow out by the anterior nares, but may pass into the throat, and be swallowed, so as to distend the stomach, and give rise to vomiting; and it is affirmed, that after the division of the frænum linguæ, in very young children, who are tongue-tied, blood enough may be sucked to occasion death before the mischief is detected.

Pathological Characters.—The stomach usually contains a quantity of black fluid, and its lining membrane is of a dark red colour, with black patches, which, when subjected to pressure, yield a black matter by exudation. Occasionally, there are signs of endogastritis, but this is not common. When the membrane does, however, present an inflamed appearance, there are here and there patches, which are produced by the infiltration of blood into the submucous cellular tissue, which retain their colour even when subjected to frequent washings.

Treatment.—Should signs of plethora or vascular excitement exist, with or without evidences of gastritis, it may be advisable to draw blood from the arm, and to adopt the full antiphlogistic treatment; but, most commonly, hæmatemesis occurs in those in whom an opposite condition of the circulatory system is present. Where it arises in consequence of obstruction of the catamenia, bleeding may also be advisable. In the last case, the French therapeutists advise that leeches should be applied to the vulva, and, if suppressed hemorrhoidal flux be the suspected cause, to the anus.

Cathartics have been recommended by many practitioners; but objected to by others. The Germans generally discard them, but without any well-founded reasons. A saline cathartic, by acting upon the whole canal, developes a succession of sympathies, which derives greatly from the concentration of morbid actions towards the stomach. Certain of the saline preparations, too,—as supersulphate of magnesia, of potassa, or soda, which may be formed extemporaneously,[a]—by coming in contact with the vessels that pour out the blood by rupture or transudation, arrest the hemorrhage by their astringent action, and are thus both astringents and revellents;—whilst by their cathartic agency, they at the same time, remove from the intestinal canal any effused blood that may have passed into it from the stomach.

[a] R.—Magnes. sulph. ℥iij.
Acid. sulphur. dil. gtt. xxx.
Aquæ f℥vj.—M.
Dose, one-quarter, four times a day.

In cases, too, of hæmatemesis, that are dependent upon amenorrhœa, the cathartic may act beneficially by contiguous sympathy, on the torpid uterus.

In most cases of hæmatemesis, unless accompanied by marked hemorrhagic diathesis, or organic disease of which the hemorrhage is merely symptomatic, the simple treatment by the solution of supersulphate of magnesia has been found by the author to be entirely satisfactory. It is probable, indeed, that the hemorrhage would generally yield to very simple measures. Dr. Marshall Hall states, that he has seen so many cases of "dyspeptic hæmatemesis and melæna" cease on giving frequent mild doses of the pilula, and the submurias hydrargyri, and simple injections of warm water daily; or twice a day, that he recommends this mode of treatment in the strongest terms; whilst Dr. Chapman as strongly advises the oil of turpentine—not only in atonic conditions, but in the acute states, after "a proper reduction by depletion." His mode of giving it is in the dose of from twenty drops to a fluidrachm, "repeated more or less frequently, according to the exigency."

Where the disease occurs in those whose blood is impoverished, and the tissues imperfectly nourished, and consequently of loose coherence, remedies must be administered, which possess the power of adding to the coagulability of the blood,—such as the iodide of iron, (gr. ij. to iv. three or four times a day,) and those advised under the head of Scorbutic Cachexia.

In hæmatemesis, astringents can be employed with full advantage, as they come in contact with the vessels that exhale the blood; and there may be cases in which the stronger astringents, as dilute sulphuric acid,[a] tincture of chloride of iron, (ten drops every three hours,) or pure tannin,[b] may be esteemed necessary.

[a] R.—Acid sulphur. dil.
Tinct. opii aā. f℥ij.—M.
Dose, twelve drops every three hours.

[b] R.—Acid. tannic. ℈j.
Opii pulv. gr. j.—divide in pulv. iij.
Dose, one, three times a day.

Some of the most rebellious cases, according to the testimony of M. Bonjean, have yielded, in a short time, to the use of ergotin, in the dose of two grains every three or four hours.

Matico has likewise been found of advantage when other agents had failed. In a case, accompanied with scarcely any feculent matter in the evacuations, Dr. Jeffreys, of Liverpool, prescribed a decoction, in the proportion of half an ounce of matico to a pint of water, of which two tablespoonfuls were given every six hours. Three doses were sufficent for the cure. The infusion and tincture have been found serviceable in similar cases. (*New Remedies*, 5th edit., p. 436, Philad., 1846.)

In all cases it must be borne in mind, that it is a most important matter to discover the pathological cause on which the hemorrhage is dependent, and to combat it. But, unfortunately, as has been shown, this often reposes on morbid conditions of the stomach, and other organs, that do not readily admit of cure. It need scarcely be said,

that where the hæmatemesis is active, or dependent upon gastritis, astringents are clearly contra-indicated, until the inflammation is subdued, after which they may be employed with propriety and advantage.

In hemorrhage from the stomach, as in all hemorrhages, it is essential to place the patient upon a dry diet; or at least not to allow fluid too freely. Under the loss of blood, the vessels greedily imbibe fluid, and the quantity of blood in them is soon as great as it was previous to the flow; but it is blood of less consistence, and consequently, more favourable to the recurrence of the hemorrhage. To allay thirst, the patient may take small pieces of ice into his mouth, or small quanties of iced lemonade—especially of lemonade formed of the sulphuric acid;—or slices of orange kept as cool as ice can make them.

VIII. DYSPEPSIA.

Synon. Apepsia, Bradypepsia, Gastroataxia, Digestio Depravata, D. Læsa, D. difficilis, Indigestio, Limosis Dyspepsia; *Fr.* Dyspepsie, Gastroatonie; *Ger.* Schwerverdaulichkeit, erschwerte Verdauung, üble Verdauung, schwache Verdauung, schwere Verdauung, Magenkatarrh (of *Fuchs.*)

Dyspepsia literally means *difficult digestion* or *indigestion.* It is a symptom of many diseases; yet it has been the custom with pathologists, for so long a time, to regard it as a distinct affection, that it cannot well be passed over, especially as there is no individual disease under which it can, with entire propriety, be classed. Some have referred it to chronic gastritis, but it unquestionably may exist independently of inflammation, as we often witness in cases of powerful emotions or mental distress—in that variety which has been termed "*nervous dyspepsia.*" This protean disease has, indeed, been a great stumbling block to pathological writers. Dr. M. Hall places it, along with hysteria and chlorosis, among diseases which consist of a general morbid affection, usually combined with some topical symptom or symptoms; and a more recent writer of our own country, Dr. Brigham, ranges it among diseases which, especially among students, arise from disease of the brain and nervous system, and are perpetuated by mental excitement. That many of the cases, referred to dyspepsia, and constituting "inflammatory indigestion," belong to chronic gastritis, cannot be doubted. They are known by more or less pain at the epigastrium on pressure; dryness and redness of the tongue; dryness and heat of skin, with, at times, quickness of pulse; yet still, cases occur, which may be properly considered under a distinct head, and which are benefited by agents, that would not seem to be appropriate in an inflamed condition of the lining membrane of the stomach.

Dyspepsia, dependent upon functional derangement of the stomach, may be considered under two heads:—the *first* embracing the transient form, or that to which the French pathologists have given the not very expressive name of *Embarras gastrique;* and the *second*, the more protracted forms of the disease—those generally meant when the term Dyspepsia is used abstractly.

a. *Transient Dyspepsia.*

Synon. Disordered Stomach; *Fr.* Embarras gastrique.

This affection is so common, that almost all have experienced it at

one time or another. When we speak of an aliment having "disagreed" with us, or that the "stomach is out of order," we mean that transient dyspepsia or indigestion has been induced. It is also the condition in which people are in the habit of describing themselves as "bilious," which, in a large mass of cases, means, that, from having taken food in too great quantity or of difficult digestion, the functions of the stomach have become disordered; the food has acted as an irritant—induced a copious secretion from the lining membrane of the organ, and the reflux of bile and other matters from the duodenum.

Diagnosis.—The symptoms, induced by this condition of the stomach, are generally—uneasiness and sense of weight, with distension and feeling of heat in the epigastric region; constant eructations, sometimes acid—at others, inodorous—but at others, again, like the washings of a gun-barrel: the appetite is lost; the very sight of food is, indeed, revolting; the head aches; giddiness is experienced, followed by nausea and retching; and, ultimately, the contents of the stomach are ejected. These are the most prominent symptoms; at the same time, the mouth is clammy, and an acid or bitter taste is constantly present; the face is pale and haggard, and great despondency is experienced; the pulse is small, and there are no signs of inflammation.

M. Becquerel found the urine often of a deep colour, and sedimentary, as in inflammation; but at times it scarcely differed from the normal secretion. The deepness of the hue appeared to be in relation to the intensity of the disorder, and to the presence of some degree of fever. In ten of twelve cases, the urine was constantly acid; in one of the exceptions it was alkaline, and contained numerous crystals of ammoniaco-magnesian phosphate. In six cases, sediments of uric acid were formed, either spontaneously or on the addition of an acid. In two, in which the symptoms were very intense, a little albumen was present; but in each case it lasted only one day. The mean specific gravity was 1021·4; the highest—and in it a sediment was deposited—1025·2, (*Simon.*)

Treatment.—This consists in removing the cause. If it have been occasioned by previous excess in eating and drinking—and it is a common result of a debauch—it passes off in a few hours. A Seidlitz powder, taken early in the morning after the excess, will often prevent it; or, if it have occurred, will diminish the morbid effects. In such cases, relief is obtained by spontaneous vomiting, and, in all cases, the cause may be removed by a gentle emetic (*Pulv. ipecac.* gr. xx.); after which the tone of the stomach may be restored by any of the bitter infusions.

℞.—Infus. gentian. comp., vel
—— colombæ, vel
—— anthemid. f℥iss.—M.
To be taken three or four times a day.

It is not easy to account for the formation of sulphuretted hydrogen—which is not usually met with in the stomach or upper part of the tube—whether, for example, it be formed by the reaction of the elements of the food upon each other, or be secreted from the lining membrane of the stomach. It passes away, however, along with the other symptoms of transient dyspepsia; but may be palliated by the use of any of

the chlorinated preparations, (*Calcis chlorin.* gr. vj. in pil.,) or by a combination of charcoal and magnesia, which is well adapted for such cases—the charcoal acting as a tonic, whilst the magnesia unites with any acid that may be present in the stomach, and a laxative salt is formed, which aids the progression of irritating matters, that may be present in the intestinal canal.

R.—Carbon. lign. gr. xv.
Magnesiæ gr. x.—M.
To be taken three times a day.

b. *Chronic Dyspepsia.*

Under this head may be considered the common dyspepsia of authors and of the people. It is characterized by the various symptoms, which occur in transient dyspepsia, except that they continue longer and induce more general disorder—of the nervous system especially. Along with distension of the stomach soon after eating, and even when a very small quantity of food has been taken, eructations of gas, sometimes inodorous, and at others of a nidorous or putrid taste; nausea; vomiting; regurgitations of an acid character; and heartburn, or pain at the pit of the stomach,—there is usually headache; clamminess of the mouth; foulness of tongue; great despondency, and commonly concentration of attention towards the affected organs; palpitation; epigastric pulsation; at times fainting; with constipation, or an irregular state of the bowels. The appetite varies:—sometimes it is lost or impaired, (*anorexia;*) at others, natural; at others, inordinate, (*bulimia;*) and at others, again, perverted, (*pica.*)

In some cases, the indigestion, instead of being *gastric*, is chiefly *duodenal.* The stomach may be more or less affected with the symptoms described above, or there may be no nausea or vomiting, and but few of the other symptoms. In this case, the prominent symptom are colic, borborygmi, with the evacuation of aliment that has not undergone perfect digestion; or the fæces may be liquid, and extremely offensive.

Causes.—The main causes are,—inattention to diet and the consequent indulgence in aliments that are indigestible by quality or quantity; sedentary habits; and, it has been asserted, intense mental application. By withdrawing the nervous energy from the stomach, and concentrating it on the brain, the former viscus, it is affirmed, suffers. This, however, may admit of question. The student, who sits closely at his labours, is apt to neglect appropriate exercise, to be irregular in his meals, and in the time allotted for sleep; and, owing to these neglects, he may become dyspeptic, but not because he employs his brain —even for a long period—in the labour for which it is naturally destined. Investigations have been entered into to show, that many distinguished individuals have fallen victims to cerebral diseases, induced by too great intellectual exertion; and it has been affirmed, that an impaired state of health would appear to be requisite for high mental exertion; but, in many of the cases cited, the individuals have suffered from habits which—if persisted in—could not fail to affect the health seriously; whilst the circumstance, that bodily indisposition confines the sufferer to the house, and, therefore, adds to his opportunities for

production, has been overlooked in the inquiry. The habitual use of agents, that act upon the nerves of the stomach, and through them on the nervous system generally, is also favourable to the production of dyspepsia. Hence, the disease is met with in the drinker of fermented liquors, and in those who use tobacco in any of its forms, but especially in that of chewing.

Treatment.—The essential treatment is dietetical. Without, indeed, a careful attention to diet and regimen, every attempt at cure will be fruitless, and this is the cause why we meet with so many confirmed dyspeptics. It will almost always be found, that animal food is more readily managed by the stomach than vegetable: there are exceptions, however, to this, as indeed to every rule that can be laid down,—individual experience suggesting most accurately the appropriate diet in any particular case. Usually, however, where animal food disagrees, it is owing to its affording too much nutriment, rather than to its being more difficult of digestion than vegetable food. Great care, therefore, must be taken that the animal food is not in too great quantity, for this will excite functional derangement, especially if there be the least approximation to gastritis. The common idea is, that the stomach, in cases of dyspepsia, should be kept occupied; but there is no question that intervals of rest are demanded, by which the powers of the organ may be recruited. Hence, it is better to have fixed periods for eating, and to be careful, that the digestion of one meal is accomplished before another is begun. In the majority of cases, weak saccharine solutions disagree in the manner described under Cardialgia, and, therefore, they are inappropriate. On this account, tea and coffee are injurious to most dyspeptics—not by reason of the infusion of the vegetables whence they are made. Chocolate is generally objectionable, owing to the oleaginous matter it contains in addition. As a general rule, it may be said, that the breakfast should consist of boiled milk, where it agrees; and stale or unleavened bread; the dinner of the digestible meats, as chicken or mutton, with the farinaceous potato; and the supper of the same materials as the breakfast. If leavened bread be permitted at all, it must be stale; new bread, especially when hot, is formed by mastication into a tenacious mass, which is not readily managed by the solvent powers of the stomach.

Where irritability of the stomach exists, the patient may have to be restricted to the farinaceous vegetable preparations—as sago, arrow-root, and tapioca, boiled in milk. Soups, consisting—as they do—of gelatin mainly, are not as digestible as is generally supposed. When taken, stale bread should be eaten with them, which gives them the due digestive texture, so that the stomach can readily grapple with them. The same remark applies to mucilages; and if the above rule be not attended to, the gum water, so strongly advised in many cases, will be found to disagree with the stomach. There are many dyspeptics with whom milk disagrees—mainly, perhaps, in consequence of the casein it contains. These persons can take with advantage a mixture of one part of cream with two parts of water, which may be substituted, in the dietary above recommended, for breakfast and supper, in place of the milk.

Such are the general rules as to diet, to be observed in cases of or-

dinary atonic dyspepsia. It is clear, however, that they cannot suit all. Each individual, after a certain term of experience, knows the peculiarities of his own stomach, and it is for this reason that the old proverb has been formed—that every man is a fool or his own physician at forty. The proverb can, indeed, apply only to his dietetic knowledge derived from experience. Moreover, the most strange kinds of aliment have agreed with dyspeptics—partly owing to idiosyncrasy, and partly, perhaps, to their exciting a new action in the digestive organs. Dr. Chapman, of Philadelphia, alludes to cases of inveterate dyspepsia in which sour beer, roasted pork, wheaten mush and vinegar, tough half-baked bread, green Indian corn, tomatoes, &c., were productive of decided advantage.

As in the cases of dyspepsia, which are now under consideration, there appears to be a want of tone in the stomach generally, and in the muscular coat in particular, it is well, in addition to attention to diet, to administer agents that are capable of impressing the nerves of the stomach, and, through them, those of the general system, in such a manner as to add to their activity. With this view, the various vegetable tonics, which owe their virtues to bitter principle, may be prescribed simply or in combination with excitants. Of these colomba, gentian, or quassia, in the form of infusion—a fluid ounce and a half three times a day—is capable of answering all the purposes of the class. The compound infusion of gentian, consisting—as it does—of gentian, orange-peel, coriander seeds, alcohol and water, is a combination which may be prescribed, where more excitation is needed than the simple infusions of the bitter vegetables are capable of accomplishing.

Wherever complications exist, they must be met by proper management. Thus, the head may be so much oppressed, as to require abstraction of blood, by cupping, from the nape of the neck; constipation may require the use of lavements; and diarrhœa may have to be checked by chalk and opium, and other direct or indirect astringents. Perhaps, however, in long-protracted cases of dyspepsia, no matter whether dependent upon atony of the coats of the stomach, or on chronic endogastritis—in every form, indeed, of dyspepsia—nothing is so markedly salutary as a thorough change of all the physical and moral influences surrounding the individual. It has been affirmed, by Dr. James Johnson, that the most inveterate dyspepsia, where no organic disease is present, might be cured by a journey of two or three thousand miles over such a country as Switzerland. The more varied the scenery and the atmospheric conditions, the greater, of course, is the revulsion; but in countries, not possessed of the advantages afforded by Switzerland, mere travelling exercise, with due attention to diet, is, perhaps, the most effectual plan of treatment that can be recommended to the dyspeptic. The use of the flesh-brush, and the shower-bath at such a temperature as not to produce too great a shock; and regular exercise, especially by walking, may be inculcated in all cases. Riding on horseback is next in value to walking; but every form of gestation is attended with benefit. It is in such cases, that the system of Priessnitz has often been found so decidedly salutary. The thorough revulsion occasioned by the different hydropathic processes to which

the patient, who submits himself implicitly to the 'water cure,' is subjected,—with the valuable adjuvants of change of locality, society, and diet, abstraction from usual occupations, whilst the mind is occupied by the varied means employed in hydropathic establishments, and the regular and systematic exercise,—form a catenation of revellent agencies, which has proved beneficial in many cases that had resisted ordinary treatment. These are, indeed, the cases in which so much benefit was said to have been produced by the *massage* or kneading or shampooing to which dyspeptic patients were subjected some years ago in New York; and for which persons, to the author's knowledge, visited that city from various and distant parts of the Union, and not unfrequently with advantage.

A question has occasionally arisen as to the proper quantity of drink most favourable to digestion. Where the salivary and other secretions are too sparing to communicate to solid food the due "digestive texture"—which can rarely happen—liquids, in proper quantity, will favour the gastric operations; but, if taken too freely, the aliment is rendered too soft, and the gastric acids are so much diluted, that digestion is more difficult. The dyspeptic must avoid the lemonade, wine, toddy, punch, &c., which are handed round occasionally before dinner: few can take them with impunity. Where the digestive powers are weak, some are in the habit of drinking water as hot as it can be swallowed after a meal; others take a small quantity of some alcoholic liquor. Both plans should be avoided, but the first is less prejudicial. It merely stimulates the lining membrane to an increase of its secretions, and by contiguous sympathy the muscular coat is excited to greater energy; but the latter coagulates the albuminous matter, and passes through the coats of the stomach into the radicles of the abdominal venous system. As an occasional course this may not be productive of evil; but mischief can scarcely fail to result from its habitual employment. The same remark is applicable to the constant use of bitter tinctures, which act mainly by the excitant influence of the alcohol they contain.

IX. PAIN IN THE STOMACH.

Synon. Gastralgia, Epigastralgia; *Fr.* Gastralgie; *Ger.* Magenschmerz.

Gastralgia, which literally means *pain in the stomach*, is symptomatic of many diseases, and is not an uncommon accompaniment of dyspepsia. Still it may be well to consider it under a distinct head, inasmuch as it may take place without any evidence whatever of previous dyspeptic symptoms. It is met with in two forms chiefly—first, in that of heartburn—the *cardialgia* of most writers; and, secondly, in that of cramp or pain in the stomach—the *gastrodynia* of authors.

a. *Heartburn.*

Synon. Cardialgia, Limosis Cardialgia Mordens, Morsus Ventriculi, Soda, Cardialgia Spuria; *Fr.* Cardialgie, Ardeur d'Estomac, A. du Cœur; *Ger.* Brennen im Magen, Magenschmerz, Magendrücken.

Heartburn consists of a gnawing or burning uneasiness, felt chiefly

at the cardiac portion of the stomach. It is a common symptom of dyspepsia, as well as of chronic gastritis, and of cancer of the stomach; and gouty individuals are especially obnoxious to it. Occasionally, the uneasiness is experienced over the whole epigastrium, with anxiety, nausea, coldness of the extremities, failure of strength, and great tendency to faintness—constituting the *Limosis cardialgia syncopalis* or *sinking heartburn*, of Dr. Good. At other times, it is an accompaniment—constitutes, indeed, a symptom—of gastrorrhœa.

It has been already remarked, that two acids are secreted from the healthy stomach—the muriatic, and the acetic—whose agency is required in digestion. Under particular circumstances, for example under febrile irritation—as was witnessed in the case of the Canadian, to which the author has had occasion to refer in other works, (*Human Health*, p. 191, Philada., 1844; and *Human Physiology*, 6th edition, i. 562, Philada., 1846,)—the ordinary secretions are arrested; and, consequently, if food were taken under those circumstances, it could not be digested. On the other hand, in special conditions of the stomach, the gastric acids are secreted in too great quantity, and, by their predominance, give rise to heartburn, and to all the symptoms that characterize *acid indigestion*. There can be no difficulty in diagnosticating this form of indigestion—acid eructations, violent heartburn, and marked effervescence, when a carbonated alkali or earth is taken, sufficiently indicate it. The gastric acids lay hold of the base, and the carbonic acid is given off,—at times, in such quantity as to sting the nose, in the same manner as it does when disengaged from champagne, or any brisk fermented liquor.

The predominance of acid, in this form of cardialgia, has been the source of speculation with the chemical pathologist, and it has been generally ascribed to the reaction of the elements of the food upon each other. A very slight examination will, however, show that such cannot easily be the fact. Every dyspeptic must have observed, that, when particular articles of diet have been taken, heartburn has been experienced almost on the instant they have reached the stomach, and when it would seem to have been impossible for time to have been afforded for the successive establishment of the vinous and acetous fermentations, when articles have been taken that are susceptible of those changes. Again, the formation of acid is equally evinced, if certain animal substances—as melted or empyreumatic butter—be eaten; and, if the acid were produced by the reaction of the elements of the food upon each other, it ought obviously to differ according to the materials that furnish it. The true explanation of these morbid phenomena would seem to be, that there are certain articles of diet, which, when they come in contact with the lining membrane of the stomach of one liable to heartburn, excite the organs whose office it is to secrete the gastric acids, so that a larger amount of these acids is formed, and, in this way, a predominance occurs—but not owing to the reaction of the elements of the food upon each other. Under this view, the acids ought to be the same, whatever may be the character of the food, and such is probably the case;—the muriatic always predominating, as it does in health, and giving rise to the markedly acid

effect occasionally produced on the teeth by the eructations, which almost all persons have experienced in the course of their existence. (See the author's *General Therapeutics and Mat. Med.*, 3d. edit., i. 359, Philada., 1846.) It is proper, however, to remark, that there is one article of diet, at least, which, under particular circumstances, becomes so suddenly acid, that the predominance of acidity may be induced by it, without the supposition of undue secretion of the gastric acids. Milk, when the air is thunderous, becomes sour almost instantaneously; and there is reason to believe, that it may rapidly undergo this change, and give rise to the development of lactic acid in the stomach, especially in children. The predominance of acidity is certainly great in them, and is largely concerned in the causation of disease, especially of the alimentary tube. It is indicated by the acid smell of the breath; the odour and taste of the regurgitated matters; the acid smell of the alvine evacuations, and their green appearance—a mixture of healthy bile and acid producing a green colour. In the adult, a certain degree of acidity may perhaps be present, without being indicated by the ordinary symptom—heartburn; and it may be the cause of the irritability of the stomach, characterized by vomiting, whenever food is received into the organ, as well as of the sleeplessness and headache, which are found to be relieved by full doses of the carbonated alkalies.

The increased secretion of acids, which gives occasion to heartburn, is usually connected with an asthenic condition of the functions of the stomach. It may occur in combination with chronic gastritis, but this is certainly—in the author's experience—the least frequent pathological condition. The means of diagnosis between chronic gastritis and ordinary atonic dyspepsia have been given under other heads. The two morbid states give rise to symptoms, many of which are similar, and demand a patient differential diagnosis.

From what has been observed above, it appears, that in certain morbid conditions of the gastric functions, particular articles of diet give occasion to an augmented secretion of those acids which, in health are essential to the production of the physical changes that take place on the food in the stomach. In other words, the organs that secrete those acids are unusually impressible, and, on the application of particular excitants, become the seat of secretory irritation.

Treatment.—This may be either *palliative* or *entire*. The palliatives are substances termed "antacids," which neutralize the redundant acid in the stomach, by combining with it as they would do outside the body. Amongst the different alkalies and alkaline earths, the therapeutist has considerable choice. If a simple antacid be needed, he may administer liquor potassæ, (gtt. x. in milk), liquor Calcis, (f℥iv.—Oss.), or carbonates of potassa or soda, (gr. x.—lx.); but if he be desirous, at the same time, to induce some degree of excitation in the mucous coat of the stomach, and through it on the muscular coat, he selects ammonia, (*liq. ammon.* gtt. v.—xx., largely diluted,) or its carbonate, (gr. v.—x.) The carbonates—and of these the bicarbonates of soda and potassa—are the mildest preparations. As regards, too, the alkaline earths, the practitioner has a ground of preference, which may be borne in mind. The salts formed by the union of the gastric

acids with magnesia, or its carbonate, (gr. x.—3i.), are possessed of laxative properties; those produced by the union of lime with the same acids, when either liquor calcis, or chalk (gr. x.—l.) is given, are of a contrary character. If, therefore, the predominance of acidity be accompanied with constipation, magnesia is selected; if opposite indications exist, lime or its carbonate. Pure argil or alumina has been advised by many in the same cases as the preparations of lime. (*New Remedies*, 5th edit. p. 87. Philad. 1846.)

The entire or radical cure of heartburn must be obtained by obviating the morbid condition, which gives occasion to the undue secretion of the gastric acids. This, as has been remarked, is most commonly accompanied by an asthenic state of the stomach. The churning process is torpidly executed; and by arousing the muscular coat to augmented action, by the appropriate administration of tonics and excitants, singly or combined, accompanied by the adoption of an appropriate regimen, as advised under Dyspepsia, the symptoms are relieved, and, if the plan be properly persisted in, often entirely removed; but no plan of treatment, which does not combine attention to diet and regimen, can prove effectual. Weak saccharine solutions; rich soups, and made dishes of various kinds; alimentary preparations, which contain a large quantity of nutritive matter in a small space; the succulent vegetable, as cabbage, especially when dressed with melted butter, and the various forms of pastry, must be carefully avoided. Experience points out the *lædentia* in the particular case, so that the patient is well aware what he ought to avoid, although he may not be able to select the food that is most appropriate for him. (For the properties of different forms of alimentary matter, see the chapter on the Materia Alimentaria, in the author's *Human Health*.)

b. *Gastrodynia.*

Synon. Gasteralgia, Gastralgia, Epigastralgia, Cardialgia, Spasmus Ventriculi, Dyspepsodynia, Cardiogmus Ventriculi, Morbus Cardiacus, Dolor Cardialgicus, Perodynia, Cardiacus Affectus, Cardiodyne, Pain at the Stomach, Colic of the Stomach, Cramp of the Stomach; *Fr.* Gastrodynie, Douleur de l'Estomac, Douleur Névralgique de l'Estomac; *Ger.* Magenkrampf, Herzdrücken, Magendrücken, Magenschmerz, Herzweh, Herzgespann.

Gastrodynia occurs in different degrees, often along with other signs of dyspepsia; and, at times, in an infinitely more severe form, commonly designated *cramp in the stomach*. Some dyspeptics are extremely liable to a neuralgic pain, resembling colic, which occurs at times before food is received into the stomach; at others, during digestion. It is, occasionally, extremely violent at the epigastrium, and may, or may not, be accompanied by vomiting. This pain is not augmented by pressure, as in gastritis, but the contrary; and it may exist for years, without the supervention of organic disease of the viscus. It comes on rapidly; soon attains its highest point, and gradually ceases,—to be reproduced under like circumstances. When it is to a slight degree only, the patient can relieve it by taking aliment, as a crust of bread; and one very severe case, the author recollects, was relieved instantaneously by this simple method practised early in the morning, whilst the stomach was empty. Many similar cases of

success are upon record. It is also relieved by exciting drinks, as by small quantities of alcohol or ether, or by any of the essential oils, (*Tinct. ol. menth. pip.* gtt. x., taken occasionally on sugar.) This form is commonly accompanied by other dyspeptic symptoms; and is, at times, an index of organic disease of the stomach. The differential diagnosis must be formed from a due comparison of the symptoms which indicate those diseases, as described in the previous pages of this work. In certain cases, the spasm of the stomach is excessively severe, and is accompanied by anxiety, nausea, coldness of the extremities, failure of strength, and great tendency to faint. It is then generally termed *cramp of the stomach*, and is relieved, as every form of gastrodynia is, by eructation and regurgitation.

Gastrodynia is induced, at times, by cold drinks, taken when in a state of perspiration, as well as by very hot drinks; and there is reason to believe that it may be owing to the transference of gout. It is more obstinate than dangerous. It has been affirmed, indeed, that it is totally devoid of danger in all cases, and after its disappearance, never leaves behind any traces of its existence. Inasmuch, however, as colic may give rise to inflammation, which may prove fatal, so, undoubtedly, may gastrodynia.

Treatment.—The treatment of the more severe forms of gastrodynia must be based on a knowledge of the causes. Although it is a pure neuralgia, it may be owing to a predominance of the acid secretion, which may require attention; or to acid or acrid substances received into the stomach. Both heartburn and gastrodynia are common accompaniments of pregnancy, especially of the early stages, when the general functions of the stomach are disordered, and nervous vomiting is an almost universal concomitant. Attention to diet, and the use of bitters and absorbents, recommended under Heartburn, will palliate those symptoms, until the cause inducing them has ceased to act.

In the very severe neuralgic forms, *cramp of the stomach*, stimulants and opiates are indispensable. Many of the so called cases are not seated in the stomach, but are owing to the passage of a gallstone along the ducts towards the duodenum. The mistake is not a matter of moment, inasmuch as opiates are required in both. The quantity demanded is sometimes very great, but the remedy must be continued until relief is obtained.

℞.—Tinct. opii f℥ij.
Æther. sulphur. f℥iss.
Aq. camphor. f℥iij.—M.
Half to be taken, and repeated every half hour.

Hot applications, as salt heated and placed in a flannel bag, or a hot trencher, or a bottle filled with hot water and wrapped in flannel, may be applied to the pit of the stomach. The whole treatment, indeed, is similar to that required in common colic.

In various forms of neuropathic disorder of the stomach in which gastrodynia is a leading symptom hydrocyanic acid has been found of marked efficacy, (gtt. j. ter. die;—in sugared water.) Creasote has been administered in similar cases,[a] and where neither hydrocyanic

acid nor creasote has succeeded in affording relief, it has been advised to give them in combination.

[a] ℞.—Tinct. creasot. ℥iv.—x.
Aq. camphor.
Infus. gentian. c. aa. f℥vj.—M. et fiat haustus.

In cases of gastrodynia which have appeared to proceed from morbid irritability of the nerves of the stomach, nux vomica, and strychniâ (*ext. nucis. vomic. resinos.* gr. i.—or, *strychn.* gr. $\frac{1}{16}$; three times a day,) have been strongly recommended. Nitrate of silver[a] has also been extolled, as well as subnitrate of bismuth,[b] which, in the opinion of some, is the most effectual of the mineral remedies employed in gastralgia. The author, however, has administered it repeatedly, but is not able to say much in its favour.

[a] ℞.—Argent. nitrat. gr. iv.
Ext. gentian. ℥ss.—M. et divide in pilulas xij.
Dose, one three times a day.

[b] ℞.—Bismuth. subnitrat. gr. xv.
Acaciæ pulv. ℥ss. Divide in pulveres iij.
Dose, one, three times a day; gradually increasing the quantity of the subnitrate to ten or fifteen grains in each powder.

Sir James Eyre and Mr. Lane have strongly recommended the oxide of silver in half grain doses, twice a day.

X. VOMITING.

Synon. Limosis Emesis, Emesis, Vomitus, Ægritudo Ventriculi, Palmus Vomitus, Sickness of the Stomach; *Fr.* Vomissement; *Ger.* Erbrechen, Vomiren.

Vomiting is a symptom, which, as has been already shown, may be an accompaniment of all the affections of the stomach hitherto considered. It is also symptomatic of various lesions of other organs, and especially of serious affections of the head. Indeed, it rarely happens, that severe morbid action goes on for any length of time, in any part of the economy, without the stomach sympathizing more or less, and vomiting being a result. There can be no question, also, that vomiting is, at times, a purely nervous phenomenon, as where it is induced by the sight of a disgusting object: and that it is frequently caused by impressions made in the first instance on the brain; of which we have examples in sea-sickness, and in that which is induced by swinging, and by riding in a carriage with the back to the horses. It can admit of as little doubt, that vomiting may arise from unusual impressibility of the nerves of the stomach, so that almost all alimentary matters may be ejected,—at times, soon after they have been received into the organ; at others, after they have undergone more or less digestion. The effect upon the constitution will of course be different under these two circumstances; in the former, the nutrition of the body must fall off materially; in the latter, it may suffer less.

Of late, Sir H. Marsh has drawn attention to cases of regurgitation of food, without nausea, many of which were evidently of hysterical origin. He has seen this in conjunction with chorea, and he remarks that in many cases of hooping cough, the partial or total evacuation of the stomach, at the close of the fit, is the result, not of the act of vomiting, but of regurgitation.

Treatment.—This may be separated into that which is immediately

necessary to allay the vomiting, and that which is demanded to prevent its recurrence.

The *first indication* is generally fulfilled successfully, by making a new impression either on the nerves of the stomach, or on others, so as to break in upon the morbid chain. In this way, stimulating glysters often afford relief. These may be made of molasses and water, to which common salt, or sulphate of magnesia, or oil of turpentine has been added. In some cases, however, the gentle stimulation afforded by soda water, or by the soda powders, is serviceable; and, in others, the absorbent earths—magnesia or its carbonates;[a] or argil;[b] or a few drops of sulphuric ether, dropped on sugar; or ice taken internally; or a few drops of laudanum; or hydrocyanic acid;[c] or creasote. This last has been found very efficacious, especially in the vomiting of pregnancy, in that connected with hysteria, and even in Asiatic cholera, and in sea-sickness,—so efficacious, indeed, as to be affirmed by some to excel all known medicines.[d] Such is the opinion of Dr. Elliotson, as well as of others; but the author's experience has not been equally favourable. Indeed, in many cases, it has appeared to develope irritability of the stomach, when it did not previously exist. In the sickness and vomiting following a drinking debauch, creasote has proved at times very serviceable: four drops have been found to afford speedy relief. (*New Remedies*, 5th edit. p. 232, Philad. 1846.)

[a] R.—Magnes. gr. xv.
Ol. anisi gtt. vj.
Aquæ f℥iss.—M. f. haustus.

[b] R.—Argill. ℥ij.
Aq. menthæ f℥iij.—M. f. mist.
Dose, one half.

[c] R.—Acid. hydrocyan. gtt. i.
Mucil. acaciæ, f℥ij.
Syrup. f℥j.
Aquæ f℥x.—M. et fiat haustus.

[d] R.—Tinct. creasot. ♏ij.
Aq. camphoræ f℥iss.—M. fiat haustus.

In certain cases of vomiting, as in that which accompanies cholera, great advantage has been found from the internal use of strychnia.

R.—Strychniæ gr. ¼—½.
Aquæ f℥iij.—M.
Dose, a spoonful every hour.

Camphor, musk and valerian, as well as the whole tribe of reputed antispasmodics, have been advised. They act merely by virtue of the new impressions they make; and they may, in this way, succeed from their action as excitants not only on the gustatory and olfactory nerves but upon those of the stomach.

When the vomiting is very severe and obstinate, these agents may not be retained long enough to excite the requisite impression. In such case, many of them may be administered either by the rectum or endermically. Opiates especially may be employed in this way;—as a general rule, three times the quantity that would be administered by the mouth, being added to the enema. When it is desirable to use the opiates, or strychnia endermically, a small blister may be applied to the epigastric region, and the acetate of morphia, or strychnia be sprinkled over the denuded surface.

Sometimes all internal remedies fail, and the vomiting yields only to the new impressions made by revellents applied to the epigastrium. These may consist of ice or of stimulating liniments,[a] or sinapisms, or

blisters; and if the latter should not succeed singly, the blistered surfaces may be dressed endermically in the method just recommended.

[a] R.—Lin. camphor. ʒx.
Tinct. canthar. ʒij.—M.

The *second indication* is of the greatest importance. After the vomiting has been checked, endeavours must be made to prevent its recurrence. With this view, the precise cause that gives rise to it must, if practicable, be discovered. Should there be any signs of vascular fulness or polyæmia, blood-letting, general, or local by means of cupping or leeching over the epigastrium, must be advised, with the warm bath, mucilaginous drinks sparingly and cautiously administered; and great attention must be paid to the avoidance of every kind of irritation. After these symptoms have passed away, or if they have not existed, the use of substances, which give tone to the stomach, and induce a new and more energetic action in its functions, as well as in those of the system of nutrition generally, may be prescribed. The vegetable tonics advised in a similar morbid condition (see Dyspepsia), as well as animal diet, will here be appropriate. In similar cases, it is affirmed, more markedly perturbating remedies have been found successful, as electricity and magnetism.

The Germans have various divisions of vomiting according to its nature;—as the *Vomitus acidus*, *V. atonicus*, *V. biliosus*, *V. crapulosus*, *V. parturientium*, &c. &c.; but they require no special mention, if we except that induced by sailing at sea, swinging, riding with the back to the horses, (*Vomitus currû vehentium.* Ger. *Erbrechen bei Fahrenden*, *Wagenkrankheit*,) &c. Sea-sickness, *Morbus nauticus*, *Nausea marina*, *Vomitus navigantium;* Fr. *Mal de mer;* Ger. *Seekrankheit*, &c., which is caused by the landsman being unaccustomed to the motion of the vessel, persists until the custom has been acquired. Various means have been resorted to as palliatives,—ether, alcohol, laudanum, &c. With some persons, they have acted as such, but in the generality of cases they have had but little or no effect. In the mean while, time has passed; the individual has become habituated to the new circumstances around him, and the distressing sickness has diminished—to disappear ultimately altogether. Some, however, are so liable to be morbidly impressed in this way, that they suffer whenever they have been for a time on shore, and return to the element to which their fortune destines them. It is affirmed that one of the most illustrious of British admirals always suffered under those circumstances.

CHAPTER IV.

DISEASES OF THE INTESTINES.

The diseases of the small intestine essentially resemble those of the stomach. Similar membranes constitute their parietes; and, with the exception of the gastric acids, like secretions take place from the lining membrane. In addition, however, two large solid viscera pour the materials of their secretion into the upper part of the small intestine, and doubtless influence the mode in which the latter executes its functions; and the varying condition of the small intestine cannot fail to react upon the liver and the pancreas.

The small intestines occupy the greater part of the abdominal cavity, the large intestines occupying the sides, crossing over beneath the stomach, and inclosing, as it were, the small intestines. The duodenum commences at the pylorus, and soon terminates in the jejunum, the rest of the tract of the small intestine being constituted of the ileum. The ileum is the intestine chiefly implicated when violent pain exists in the umbilical region.

In studying the diseases of the large intestine, it is important to bear in mind the position which it occupies in the abdomen. It commences at the right iliac fossa, in which it is bound down, so that it cannot change its position. This portion, which forms a *cul-de-sac*, is the cæcum. It extends from the point at which the small intestine, the ileum, opens, to the blind extremity. At the termination of the ileum is the valve of Bauhin, which is so constituted, that the lips, which form it, separate when the fæcal matters pass from the small towards the large intestine; whilst they approximate, cross, and completely prevent all retrogression, when the fæces tend to proceed from the great intestine to the small. Yet, as will be seen, fæces may pass through it, and be vomited.

At the posterior and left side of the cæcum, is the worm-like process, the *appendix vermiformis cæci*, which is at times affected with disease. The colon commences at the cæcum, ascends along the right flank as far as the under surface of the liver, crosses over the abdomen to gain the left flank, along which it descends into the left iliac region to form the sigmoid flexure, which varies greatly in length in different persons, frequently extending into the hypogastric region, and in some instances across to the cæcum.

The coats of the large intestine are the same in number and structure with those of the small, but they are thinner, and not as separable on dissection. The most characteristic difference is the pouched arrangement of the large intestines, the pouches being reservoirs for the excrement, in which it becomes more indurated by the absorption of

its fluid portions. The longitudinal muscular fibres are concentrated in three fasiculi.

The colon terminates in the rectum, which differs from the rest of the large intestines in its thicker parietes, the muscular coat being very powerful. Immediately within the anus is the widest portion of the rectum, in which accumulations of indurated fæces sometimes take place in old people, owing to the torpor of the powers concerned in their expulsion.

The large intestine is a reservoir for the fæces, which, when extruded, have the shape of the intestine, or of the aperture through which they have been evacuated. If, consequently, the shape of either of these be modified, that of the excrement becomes so likewise; accordingly, in stricture of the colon, especially of the sigmoid flexure, and of the rectum, the fæces are forced through the constricted portions, and are evacuated of very small size, or in the shape of ribands. The fæces do not pass into the rectum in large quantity, unless they are very fluid, but are generally detained in the colon, until the desire for defecation arises, when they clear the annulus at the termination of the colon and commencement of the rectum, and pass freely into the latter intestine to be evacuated.

Diseases, which implicate one portion of the alimentary canal, are apt to extend to others; hence gastritis and enteritis are more frequently a compound of both, or *gastro-enteritis;* and inflammation of the ileum, or other portion of the small intestine and the colon, are less ileitis and colitis than cases of *ileo-colitis*, and as such they have, accordingly, been described by many pathologists.

I. INFLAMMATION OF THE INTESTINES.

SYNON.—Empresma Enteritis, Enteritis, Intestinorum Inflammatio, Ileocolitis, Chordapsus, Cauma Enteritis, Colica Inflammatoria, Ileus Inflammatorius; *Fr.* Entérite, Inflammation des Intestins; *Ger.* Entzündung der Gedärme, Darmentzündung.

Like gastritis, enteritis may be divided into the *acute* and the *chronic*, and both, again, may be subdivided into enteritis of the peritoneal coat, and enteritis of the mucous coat; the muscular coat being rarely, perhaps, the primary seat of inflammation, but not unfrequently of a severe neuralgic affection, at times of a gouty or rheumatic character, which will be described under ENTÉRALGIA.

I. *Inflammation of the Small Intestines.*

a. *Inflammation of the Peritoneal Coat of the Small Intestines.*

SYNON. Enteritis, of most British authors, Exoënteritis, Seroënteritis; *Ger.* Dunndarmentzündung.

1. *Acute form.*—Acute inflammation of the peritoneal coat may attack any portion of the small intestine, but the essential phenomena and pathological characters are alike in all. When presumed to be seated in the duodenum, it has been termed *Duodenitis* or *Dodecadactylitis;* in the jejunum, *Jejunitis;* and in the ileum, *Ileitis;* but considerable confusion has resulted in consequence of these terms having been often employed indiscriminately for both inflammation of the

peritoneal and of the mucous membrane of those portions of the small intestine.

Diagnosis.—The phenomena are generally well marked, with the exception of the state of the pulse, which may lead the superficial into error. The most prominent symptom is—pain over the region of the inflamed intestine, generally very severe, and always increased by pressure, sometimes even by the light pressure of the bed-clothes. If the duodenum be inflamed, the pain is seated high up in the pyloric region, and shoots back towards the kidneys; if the seat of the inflammation be lower down in the jejunum, and especially in the ileum, the pain is generally referred to the region of the umbilicus. In very acute cases, nausea and vomiting are almost always present; the tongue is usually more or less covered with a white fur; the respiration is short and quick, mainly owing to the pain produced by any great depression of the diaphragm, but partly to the general disorder of functions; the pulse is quicker than natural, but instead of being strong—as in many cases of inflammation, which are devoid of danger—in amygdalitis, for example—it is small and contracted, but if careful examination be made, it is found not to be weak. It is a pulse whose characters are owing to rigidity of vessels, induced by the existing inflammatory affection; and accordingly it becomes developed under copious abstraction of blood, and the use of other appropriate sedatives. Along with these symptoms, the skin is hotter than natural; and, in at least nine cases out of ten, there is constipation. On the other hand, when the lining membrane is inflamed, diarrhœa is present in the same ratio. The constipation, in inflammation of the peritoneal coat, is probably owing to the concentration of vital action towards the inflamed membrane, which detracts from the vital activity of the mucous coat, and diminishes the secretion from it.

In inflammation of the small intestine, the system suffers more than in that of the large intestine; and, according to the author's experience, inflammation of the peritoneal coat of the former is much more frequent. Although we meet constantly with cases of inflammation of the mucous membrane of the large intestine, inflammation of the serous coat is, comparatively, of rare occurrence.

In acute enteritis the urine is generally of a fiery red colour, acid, and, after some time, throws down a reddish sediment of uric acid and urate of ammonia,—possesses, in other words, the characters of inflammation. In eight cases of mild enteritis and diarrhœa, M. Becquerel on one occasion only detected a small quantity of albumen.

In this, as well as in other affections of the small intestine to be mentioned hereafter, it is always well to examine, whether the patient be affected with hernia. A distinguished writer affirms, that he has seen several cases in which female patients, who had positively denied the existence of any swelling in the groin, had been found, after death, to have died of strangulated hernia.

The disease is of the most formidable character, although generally easily overcome, if the physician be called early. Most unexpectedly, at times, the patient sinks; the countenance becomes collapsed; the extremities cold; the body covered with a cold, clammy perspiration;

the pulse vanishes, the pains disappear, and the patient dies. The depressing influence on the sanguiferous system, and, indeed, on the whole frame, made by diseases of the intestinal canal, is at times singularly evinced, and must always be borne in mind. The author has elsewhere (*General Therapeuties and Mat. Med.*, 3d edit. i. 432, Philada. 1846,) referred to an interesting case of the kind, which he attended with Professor Smith, of the University of Maryland. A student, after having attended lectures through the day, was attacked with vomiting, which recurred repeatedly, but without any abdominal tenderness, or other uneasines. On the following morning, there was slight tenderness on pressure, and the vomiting continued. He was cupped over the abdomen, although neither the state of the pulse nor skin, nor the other symptoms, appeared to indicate much inflammatory action. During the day he gradually sank, and expired the same evening. On examining the body, the ileum was found contracted for the space of several inches, but this contraction had evidently been forming gradually, and only amounted to positive obstruction a short time previous to this attack. The coats of the intestines exhibited but slight evidences of inflammation.

Causes.—The chief causes are—derangement of capillary action, induced by exposure to cold and moisture; irregular action of the bowels; and mechanical injuries from wounds and bruises.

Pathological Characters.—As this form of enteritis is really peritonitis, the symptoms of which are modified by the subjacent viscus, the pathological appearances must be essentially those of peritonitis proper,—more especially effusions of plastic lymph, which lead to adhesions between the intestines. Gangrene is not as common a termination as is generally supposed.

Treatment.—The sheet-anchor of treatment, as in other cases of inflammation of serous membranes, is bloodletting, pushed so as to produce a decided effect upon the system; but short of inducing syncope, which is always followed by reaction. Immediately after the bloodletting, a full sedative dose of opium should be administered in the form of soft pill, (gr. ijss.—iij.) This allays any tendency there may be to reaction, and has accordingly, by some, been placed in an equal, if not a superior rank with bloodletting. In serous enteritis, a distinguished observer, Dr. Armstrong, highly extolled it, and although he esteemed it best to unite it with bloodletting, and to repeat both remedies according to the urgency of the case, he was disposed to think, that if he himself were labouring under peritoneal enteritis, and were told that he must repose his hopes upon the lancet singly, or upon opium singly, he should be disposed to select the latter.

It will be essential for the physician to see his patient in the course of a few hours after the first bloodletting and administration of opium, and should the pain on pressure be as great, and the general signs of inflammation as urgent, the bleeding should be repeated, with a dose of opium (gr. ij.), and it will rarely happen that farther active agents will be needed. Some of the German physicians advise, after general bloodletting, that leeches should be applied over the affected part, and

that opium in powder should be administered every half hour or hour, until the pain is relieved, and rest supervenes.

℞.—Opii pulv. gr. ss.
Acaciæ pulv.
Sacchar. alb. āā gr. vj.—Divide in dos. vj.

Should it be considered advisable to apply leeches; after they have fallen off, hot fomentations may be used over the leech-bites, and be frequently renewed; or, if the weight can be borne, a large bread and milk or flaxseed poultice. With a similar view, enemata of warm water may be thrown into the large intestine, by means of a long flexible tube.

As constipation is a prominent symptom of peritoneal enteritis, the obvious remedy with the incautious or uninformed is an active cathartic; but it need scarcely be said, that cathartics should be employed with caution, for fear that the irritation, which they excite, may add to the inflammation. In such cases, as has been well said by Dr. W. Saunders, the best cathartic is the lancet; and if it be followed up by a full sedative dose of opium, as recommended above, the bowels will respond without the aid of a cathartic. The constipation is generally dependent upon the inflammation, and when the cause is removed, the effect will cease.

Revellents may be applied to the abdomen, if the tenderness permit; and when the depletion and opiates have been pushed as far as the physician deems advisable, a blister may be applied over the abdomen, which may be dressed by one of the preparations of morphia, the sulphate, the acetate, or the muriate, made into an ointment;[a] or one or two grains of either of the salts of morphia may be sprinkled upon the denuded surface, which may be subsequently dressed with simple cerate.

[a] ℞.—Morphiæ sulphat. seu acetat. seu muriat. gr. iv.
Ung. simpl. ℥ss.—M.

Perhaps, however, here, as in all cases of inflammation of the serous membranes, it may be well to endeavour to affect the mouth slightly, by rubbing in unguentum hydrargyri, (℥j.—℥ij.) night and morning. The new action, thus induced, is often entirely effectual in uprooting the original malady.

As in other inflammations, in which bloodletting is recommended, liquids should not be permitted too freely; but ice may be taken to allay the thirst, which is frequently urgent. The diet must be altogether farinaceous—sago, tapioca or arrow-root,—gradually passing to animal food as the inflammation fades away.

2. *Chronic form.*—The chronic form of peritoneal inflammation of the intestines is not a very common disease, yet we meet with it yearly in our public hospitals, and frequently along with tubercles of the serous membranes. Like the acute form, it may be seated in any portion of the small intestines.

Diagnosis.—The symptoms that denote it are often extremely obscure. Pain is usually felt in some part of the abdomen by pressing firmly upon it, by moving the body, or, on coughing and sneezing. The patient is likewise subject to attacks of colic, and to various evi-

dences of indigestion. Commonly, the bowels are constipated, but often the constipation alternates with diarrhœa. The general symptoms may be insignificant; at times, fever exists, but at others, it is nearly or wholly absent. When the disease has continued for some time, the intestines are apt to become glued together by the effusion of plastic lymph from the inflamed surfaces, and occasionally knotty irregularities can be felt by carefully pressing upon the relaxed abdomen. These morbid formations occasionally end in suppuration, the pus being discharged either into the bowels or the cavity of the peritoneum; and the patient dies worn out by the consequent hectic. At other times, the peritoneal tumours, by interfering with the due circulation of the blood in the abdomen, destroy the balance between the exhalents of the peritoneum and the absorbents; and dropsy of the abdomen is the consequence.

Causes.—Repeated attacks of colic, or other intestinal disease, may induce it, or it may be the sequel of acute enteritis.

Treatment.—This must consist in the occasional application of leeches or cups; keeping the intestinal canal entirely free, by means of emollient enemata; and allowing only a demulcent diet, like that described under the head of acute enteritis of the peritoneal coat. In this form, the use of mercurials, and the whole class of revellents, is found to be of great service. Mercury may be administered, by friction with unguentum hydrargyri (3j.—3ij.) over the abdomen, night and morning, until the mouth becomes slightly affected; or mercurials may be administered internally.[a] Red iodide or deutiodide of mercury is well adapted for old cases, in which there is reason to believe that the intestines have been rendered adherent in the manner described above, or that peritoneal tumours have formed.[b]

[a] R.—Hydrarg. chlorid. mit. gr. xij.
Opii pulv. gr. iij.
Glycyrrhiz. pulv. ʒss.—M. et divide in pil. xij.
Dose, one night and morning, until the mercurial influence is exerted.

[b] R.—Hydrarg. iodid. rubr. gr. x.
Micæ panis,
Sacchari pulv. āā ʒj.
Aquæ q. s. ut fiant pilulæ lx.
Dose, one morning and evening.

b. *Inflammation of the Mucous Coat of the Small Intestines.*

Synon. Endoënteritis, Mucoënteritis, Mucous Enteritis, Esoënteritis, Phlegmymenitis enterica, Enteritis of most writers of the European continent.

Acute inflammation of the mucous coat of the small intestines is less common than the chronic form, and both are usually less violent in their character than inflammation of the peritoneal coat.

1. *Acute form.*—Acute inflammation of the mucous coat, like that of the serous coat, may be seated in various portions of the small intestine: the first effect, as in every inflammation of mucous membranes, is to arrest the secretion, which naturally takes place from them. Unless, however, the inflammation be speedily removed, the secretions become subsequently increased in quantity, and morbid in quality. If, too, the inflammation be seated in the mucous membrane of the upper portion of the small intestines, and especially of the duo-

denum, the inflammatory irritation is extended along the mucous lining of the biliary and pancreatic ducts to the liver and the pancreas; so that their secretions may become first of all arrested, and subsequently of morbid character. The duodenum is, hence, the seat of many of those affections that are termed *bilious;* and on it the cathartics, which are termed *cholagogue* or bile expellers, exert their agency in the first instance; the impression being thence conveyed, by sympathy of continuity, to the liver. Not many years ago, every form of dyspepsia—transient or chronic, gastric or duodenal—was termed *bilious;* and every article of diet, which disagreed with the stomach or bowels, received the same epithet. An improved acquaintance with pathology, has shown the fallacy of these notions; and, accordingly, we now rarely hear the epithet employed in any case. Even *bilious fever* is disappearing from our nomenclature, and we now speak of remittent fever with gastric complications, in the same sense. It was proper, indeed, that the term bilious, if retained, should have some definite meaning attached to it; inasmuch as it had been applied not only to the affections in which the bile was supposed to predominate, but to those in which it was esteemed to be defective in quantity.

Diagnosis.—The prominent symptoms of mucous enteritis are the following:—pain, which is very manifest, if the inflammation be violent; less so, if it be obscure, but which may be always detected by careful pressure,—the pressure being made with the tips of the fingers, whilst the patient takes in a deep inspiration. It is right, however, to remark, that the mucous membrane of the intestines, neither in health nor disease, is as sensible as might be conceived *à priori.* In wounds of the stomach, it may be pressed upon by a solid body, without pain being experienced; and in the well-known case, which fell under the care of Dr. Beaumont, and which was seen by the author, when the elastic gum tube, employed for collecting the gastric juice, was pressed forcibly against the mucous membrane of the stomach, gastric disorder was induced, but not pain. In disease, too, inflammation may be present, and even ulceration, yet neither condition may be indicated by pain. As in gastritis, there is thirst, but still no particular preference for cold drinks; the patient, indeed, often prefers them warm; the tongue is generally red at the sides or tip, and sometimes in the centre; and the bowels are looser than in health. It has been affirmed, indeed, by Dr. Armstrong, that the bowels are scarcely ever lax, if the small intestines alone be inflamed; that they are very easily moved, and a large quantity of mucus is passed; so that the evacuated matter moves in the utensil, like thin, white paint, and is of a mucilaginous or oily consistence; but this is not the result of the author's observation. Whenever the mucous membrane of either the small or the large intestine is inflamed, and continues to be so for some time, diarrhœa, or alternations of constipation and diarrhœa, are inevitable results. The excitation in the mucous coat augments the secretion from it, whilst the muscular coat is aroused to action by contiguous sympathy, and an increase in the liquidity and number of the evacuations is a necessary consequence.

When these are examined by the microscope, they are found to contain—in addition to the mucous and fæcal matters coloured yellow by bile-pigment—a peculiar flocculent mass like exuded lymph, which on more accurate examination, appears to consist of purulent and fatty matter. Blood is likewise found in them. (*Simon.*)

A more fanciful division of enteritis has been made by some writers,—into superficial erythematous enteritis or diarrhœa; a deeper seated variety, which extends to the muscular coat—dysentery; and a phlegmonous variety seated in all the three membranes—the mucous, muscular, and peritoneal; but the division is arbitrary, and not borne out by pathology, as will be seen under the appropriate heads. At times, blood and pus are observed in the discharges.

It can rarely happen, that serious inflammation can exist in any part of the mucous membrane of the small intestine, without the functions of the stomach suffering more or less; accordingly, nausea and vomiting are common attendants. The pulse is usually—almost invariably—quicker and stronger than natural, but it rarely presents the contracted character, which we witness in peritoneal enteritis.

In inflammation of the mucous membrane of the intestines, the abdomen is said to be almost invariably flat,—exceptions being at least very rare, and when they do occur, there is mostly a conjunction of muco-enteritis, and sero-enteritis. This is doubtless owing to the circumstance, that peritoneal enteritis is usually accompanied with constipation, and therefore with flatulence, whilst an opposite condition prevails in mucous enteritis. The disease, when very acute, runs its course to health, or to a fatal termination in a few days; if not so violent, its course may be slower; and both forms may—and are apt to—terminate in the chronic.

Causes, and Pathological Characters.—These are essentially the same as those of gastritis of the mucous membrane. The affections are seated in portions of the same membrane, and consequently, must be affected similarly by deranging influences, and present essentially the same appearances on dissection. The mucous membrane, in simple acute endogastritis, is found injected, discoloured, softened, and at times, ulcerated—*Enterelcosis*, Ger. *Darmverschwärung*—and the degree to which these appearances are met with is dependent upon the intensity and duration of the inflammation.

Treatment.—The treatment is based upon the same principles as in gastritis of the mucous membrane. Bloodletting is needed generally or locally. If the accompanying fever be great, it may be from the arm; if less, leeches may be applied over the abdomen, and be repeated again and again, if necessary. The number must be determined by the intensity of the disease. Cupping can here, likewise, be employed in the majority of cases; but where the cups occasion too great uneasiness, leeches must be substituted.

It need scarcely be said, that all drastic cathartics must be carefully avoided; yet, morbid secretions cannot fail to be poured into the intestinal canal which ought to be removed daily, either by small doses of castor oil, (f℥j.—℥iij.) or by enemata. These may consist simply of warm water, to which castor oil (f℥ss.—℥j.) may occa-

sionally be added, and care must be taken to make them pass into the colon. They act, in this way, both as laxatives and as fomentations. The author is satisfied, that he saw a case of acute endo-enteritis hastened to a fatal termination by an active cathartic, which induced hemorrhage from the bowels; and a similar result has been observed in the same cases by others. A writer of eminence of the present day, Dr. Marshall Hall, considers, that simple enemata of warm water, "constitute one of our chief remedies" in mucous enteritis. Poultices to the abdomen, and the gentler revellents recommended under Gastritis, may also be employed advantageously.

In this disease, as well as in dysentery, fomentations of the infusion of tobacco to the abdomen may be found advantageous. They have been highly extolled in the latter affection. They may be made of a quarter of a pound of leaf tobacco to four or five quarts of water. Under their use, the tormina have been found to abate, and the force of the circulation has been reduced, with less expenditure of the general strength than when bleeding only is employed.

The diet, too, must be regulated according to the same rules. Arrow-root or sago, prepared with water, acts as a demulcent—when the lining membrane of the stomach is inflamed—by coming immediately in contact with it whilst its nature is unchanged; but even when the seat of the inflammation is lower down the tube, and the demulcent has undergone stomachal or duodenal digestion, or both, it may be advantageous. The soothing influence exerted by it on the lining membrane of the stomach is conveyed by continuous sympathy to the part labouring under inflammation, and the excrementitious portion of the diet is as void of irritating qualities as any fæcal matter can be. Hence, the farinaceous aliments are not only dietetic, but medicinal agents, and a combination of them has been employed, therapeutically, as a demulcent, under the name of *Castillon Powders*, so called after the physician who first proposed them. They are formed by *sago*, in powder; *salep*, in powder; *tragacanth*, in powder, of each, four parts; *prepared oyster shells*, one part; *cochineal*, half a part, mixed together, and divided into powders of one drachm each. One of these is given three or four times a day in this disease, as well as in diarrhœa and dysentery.

A regulated temperature of the chamber, so as to prevent any irregular action of the capillaries, with confinement to bed, should be likewise inculcated.

2. *Chronic form.*—This may be the sequel of the acute form, but frequently it has no preceding acute stage.

Diagnosis.—The symptoms are of course less intense than those of acute endo-enteritis, but they are somewhat similar in their character. Occasionally, indeed, the disease is exceedingly insidious and runs on most unexpectedly to ulceration, and, at times, to perforation. The pain of the abdomen is usually more obscure, more deep-seated apparently; and is but little, if at all, affected by pressure. Uneasy feelings, however, are experienced after stomachal digestion has been completed, and the aliment has been sent on into the small intestine. If the chronic inflammation be seated in the duodenum, constituting

chronic duodenitis, the pain is felt three or four hours after a meal in the region of the pylorus, shooting to the back, along with the signs of indigestion that accompany chronic gastritis. For the reasons before assigned, duodenal inflammation gives rise to morbid conditions of the liver; in the first instance, perhaps, to diminution of the secretion from that viscus, but subsequently to augmentation of it. It can readily, too, be understood, that the constant irritation, kept up in the liver by chronic duodenitis, may modify its function of nutrition, so as to induce serious and permanent hepatic disease. Many morbid conditions of the liver are doubtless caused in this manner. The constant stimulus, from the habitual use of spirituous liquors, on the lining membrane of the stomach and duodenum, is propagated to the liver by continuous sympathy, and at the same time, the stimulating fluid passes by imbibition into the veins of the stomach, which convey it, mixed with the blood, to the liver: under this double influence, it must happen that in most hard drinkers the nutrition of the organ is sooner or later modified.

In chronic endo-enteritis—for pathological reasons before given—the evacuations are generally frequent and liquid,—mucous, sometimes bloody, and occasionally purulent. More commonly, however, they give evidence of increased secretion of bile, and of imperfect digestion of the food. Not only stomachal, but duodenal digestion is impaired. Occasionally, the patient is troubled with flatus, and generally with more or less griping. The parietes of the abdomen are flat, as in the acute form, except when accidentally distended with air; the skin is at times hot, and almost always dry and rough; and the complexion sallow. Emaciation takes place slowly, the consequence generally of ulceration; hectic exacerbations are manifest, and the patient gradually sinks to death—*Enterophthisis, Consumption of the bowels;* Ger. *Darmschwärsucht, Unterleibsschwindsucht.* Under more favourable circumstances, he recovers his health, but usually after a long period of suffering.

In children of a scrofulous diathesis, the inflammation of the mucous membrane induces a similar condition of the mesenteric ganglions, and frequently lays the foundation for tabes mesenterica.

Causes.—Long-protracted diarrhœa or dysentery, or these diseases —which may be regarded as congenerous affections—badly treated by the use of excitants, or of too powerful astringents, may occasion it. Any affection, indeed, which produces organic changes in the bowels, may act as a cause. The German writers, especially, regard the metastasis of herpes, tinea, scabies "rapidly cured," and the healing up of ulcers and issues, to which the system has become habituated, as causes; but this occurs less frequently than is imagined, and, in the case of some of the cutaneous affections mentioned, perhaps never. Where an irritation has existed for a length of time, and has become an affair of habit, or of accustomed associated actions, and such irritation has been removed, it can be readily understood, that a similar condition may be induced elsewhere, and it is more likely to occur in some part of the same or of a similar texture. The mucous membrane being a part of the dermoid tissue, if any cuta-

neous irritation be removed, the next probable seat of irritation may be some part of that tissue; and, accordingly, we witness an extensive consent between the skin and mucous membrane of the bowels, in various eruptive and other diseases; but where the skin has been partially in a morbid condition, and that only for a short period, the danger of metastasis is almost null; and hence the practitioner does not hesitate to use all his endeavours for the removal of the cutaneous diseases referred to above, without any apprehension of chronic endo-enteritis, or other affection of the bowels, being the consequence.

Pathological Characters.—The appearances of the mucous membrane are like those in chronic gastritis—redness, sometimes vivid, at others, of a brown or violet hue; at times, hypertrophy, but at others, atrophy of the parietes of the canal. Where hypertrophy exists, there is usually stricture. Perhaps, however, the most common appearance is ulceration, which is observed most frequently towards the end of the ileum. The edges of these ulcers are vertical, and both the mucous and muscular coats are frequently destroyed, so that the base of the ulcer is formed by the peritoneal coat. The follicles often enlarge, and the general irritation of the membrane appears, at times, to depend upon their condition. In the acute form, the agglomerated follicles are most frequently affected, whilst in the chronic, it is the isolated. The follicles, under such circumstances, may become ulcerated; and around the edges of the ulcers, tubercles are not uncommonly met with. In such cases, they are generally found to exist elsewhere.

Treatment.—This reposes upon the same principles as that of chronic gastritis of the peritoneal coat. It is not often requisite to take blood from the arm, but cups or leeches may be applied over the abdomen, from time to time, should the symptoms indicate the necessity. The French are in the habit of applying them to the anus, and this form of revulsive bleeding is often of eminent service. When the disease, too, has become unquestionably chronic, the various forms of revellents may be used advantageously. If the discharges from the bowels are very copious, it may be advisable to exhibit starch and laudanum enemata,[a] two or three times a day; and, in all cases, the warm water enemata, advised in cases of acute inflammation of the mucous coat, will be productive of benefit, as warm and soothing fomentations. In like manner, a warm, moist poultice, applied over the abdomen, when its pressure can be borne—and if not, the dry hop poultice, formed by putting hops into a flannel bag and heating them—affords essential relief in many cases.

[a] ℞.—Decoct. amyli Oj.
Tinct. opii gtt. xxx.—M.

Although in the early stages of inflammation of the mucous membrane of the intestines—as of inflammation of other mucous membranes—antiphlogistics may be the most appropriate agents, there is a condition in which excitants may be administered with advantage; that is, when the violence of the inflammation has subsided, and the remaining inflammation and the discharges are kept up by the asthenic condition of the over-distended extreme vessels. In these cases, how-

ever, we generally have recourse to excitants that belong to the class of astringents. When the complaint has persisted for a time, notwithstanding the general antiphlogistic medication and regimen, and the constant use of mild laxatives, as of small doses of castor oil, (f℥j.—f℥iij.), or emollient enemata, to remove all offensive secretions from the tube, gentle astringents may be employed with advantage. In very urgent cases, indeed, it may be necessary to have recourse to the more powerful, administered both by the mouth and rectum, and their agency may be increased by the addition of opium, to allay the irritability of the canal, which the erethism of the mucous membrane so largely developes. If these fail, no plan can be adopted with better prospect of success than the revulsion produced by change of air, which is at times successful after every other effort has failed.

Such are the general principles of treatment. The particular agents for carrying them into effect, will be understood by referring to Diarrhœa and Dysentery.

c. *Exanthematous Inflammation of the Mucous Coat of the Small Intestine.*

In treating of the inflammation of the lining membrane of the stomach, it was observed that it—as well as the mucous coat of the intestines—is liable to eruptions in the same manner as the skin, of which we know it to be a prolongation. In measles and scarlatina, the peculiar inflammation is apparent; and an exanthematous affection has been observed in cases of cholera; and, according to some, an affection implicating the follicles of Peyer and Brunner, and called, by its first describer, M. Bretonneau, *Dothinentérite* or *Dothinentérie*, is the most constant symptom of typhoid fever. By some, indeed, the follicular lesion has been regarded as its most distinctive character. These lesions will, however, be more properly considered under Cholera and Typhoid Fever.

The inflammation of the lining membrane of the intestines of the infant may vary in character like that of other mucous membranes, and be erythematous, pseudo-membranous, ulcerated, or follicular. The inflammation of the patches of Peyer is often identical, except in intensity, with that of the typhoid affection (q. v.) The appearance is the same, and, according to MM. Rilliet and Barthez, "if there be a difference between the two diseases, it must be sought for elsewhere than in the lesion of the *plaques* or patches." These gentlemen maintain, indeed, that there are many relations between typhoid fever and enteritis in the infant.

II. *Inflammation of the Large Intestines.*

a. *Inflammation of the Cæcum.*

Synon. Typhlitis, Typhloënteritis, Tuphloënteritis, Inflammatio Cæci, Phlegmonous Tumour of the Cæcum; *Fr.* Inflammation du Cæcum; *Ger.* Entzündung des Blinddarms.

The diseases of the cæcum and of the appendix vermiformis cæci have received great attention from pathologists, of late years more especially. Attention had, however, been directed to them previously—especially to the phlegmonous tumours that form in the right iliac fossa.

Diagnosis.—Simple acute inflammation of the lining membrane of the cæcum may be an accompaniment of colitis or dysentery; but it may occur independently of these. The most marked symptoms are violent pain in the right iliac fossa, increased on pressure, by which it is rendered lancinating. The pain is constant, and often proceeds in the direction of the ascending colon. The evacuations are copious and frequent, sometimes from ten to twenty in the day, and are mucous or bloody, or both; and, along with these symptoms, there is generally gastric disturbance and fever, the pulse being accelerated and hard, the skin hot and dry, and the urine high-coloured, as in ordinary cases of severe internal inflammation.

Inflammation may likewise attack the peritoneal coat solely, or along with all the coats of the intestine, and these are the cases to which attention has been mainly directed of late years. They are attended with more or less tumefaction in the iliac region, and are owing to some mechanical impediment in the cæcum, constituting *Typhlitis stercoralis.* Where the disease affects the peritoneal coat, it is marked by the ordinary signs of peritonitis, or rather of inflammation of the peritoneal coat, of which constipation is one. The inflammation may extend to the cellular tissue surrounding the cæcum—*Perityphlitis*—and is indicated by an inflammatory pain in the iliac region with distinct hardness, constipation and numbness of the thigh —owing to the tumour pressing upon the nerves as they pass down to the right lower extremity—and occasionally retraction of the testicle. This form of the disease may terminate by resolution, or in any of the results of cellular inflammation. Pus may form and be discharged into the cæcum, or into the cavity of the abdomen; or perforation may take place through the intestine and the parietes of the abdomen; and where the disease terminates fatally, a large cavity is generally observed in the vicinity of the cæcum, separated from the cavity of the abdomen by the peritoneum. In a case, which fell under the author's care, the pus was discharged into the urinary organs, and the female recovered.

Idiopathic inflammation of the cæcum from ordinary causes, as from exposure to vicissitudes of weather, is certainly rare. Yet the author has observed three or four cases in which no other cause could be assigned than such as might have induced inflammation in any other part of the digestive tube or of any internal organ.

The symptoms, that indicate typhlitis induced by mechanical causes, are—very decided evidences of local inflammation coming on without any very obvious cause, when the patient is in health; and the comparatively slight implication of the general system, as shown by the greater or less freedom from fever. The pain commences in the very seat of the cæcum; gradually augments for from twelve to twenty-four hours, and is constant. Careful examination now shows fulness and tension of this part of the abdomen, with tenderness on pressure, and dulness on percussion; the bowels are constipated, and the functions of the stomach disturbed. The general system now sympathizes, and the ordinary symptoms of internal inflammation declare themselves. Any motion of the body induces pain, so that the patient lies on his

back, inclining towards the right side, with the thigh bent on the abdomen so as to relax the abdominal parietes. The symptoms go on in this manner for some days, the affection gradually extending, more or less, over the abdomen, which now becomes full and tense. The pain over the cæcum is lancinating, and the slightest touch with the finger, or the slightest covering, excites excruciating torture. Still, the danger does not seem so imminent as in acute enteritis, although in the sequel it may prove equally fatal.

It is obvious, that a favourable termination of a case of this kind cannot be expected until the mechanical impediment yields; but if this be removed, all the symptoms soon vanish. This, however, can rarely be accomplished in less than a week. About this period, it may happen, that if the bowels have not responded to the means employed, the patient's strength declines and he dies; and it has been conceived by one writer, Dr. Burne, that if much blood has been abstracted, he may sink rather from exhaustion than from the effect of the inflammation: this, however, is scarcely probable; but if life be prolonged, there may be discovered, about the tenth day, a circumscribed emphysematous tumour in the right ilio-inguinal region, or posteriorly in the corresponding iliolumbar region, which is a fæcal abscess making its way to the surface. If in the former case, the peritoneum must be perforated after adhesions have been formed around the part to be perforated; if in the latter, the abscess trends upwards and backwards towards the least resisting part of the lumbar parietes, which is at the outer edge of the quadratus lumborum muscle. In this way it may be discharged, and recovery take place, or the patient may die worn out by irritation.

Perforative abscess of the cæcum must be esteemed a serious malady. Of seventy-three cases, death occurred in twenty; and in eleven others, the symptoms were so severe as to threaten life. Stercoraceous abscesses appear to be the most fatal, the ratio of deaths being five in seven, according to M. Grisolle.

Treatment.—The remedies adapted for this affection are those for local inflammation. General bloodletting may be required, but it cannot be necessary to repeat it often. The great indication is, to temper the inflammation as far as possible, and especially to remove the cause, where the disease is owing to hardened excrement, or to any undigested matter,—as stones of fruit, charcoal, magnesia, &c., which are sometimes known to lodge in the cæcum.

Simple typhlitis of the mucous membrane requires the same treatment as colitis; and perityphlitis the same management as any case of partial inflammation of the cellular or serous membranes.

In cases of inflammation of the cæcum from mechanical causes—*Typhlitis stercoralis*—after general bloodletting has been practised, leeches may be repeatedly applied; the practitioner bearing in mind, however, that if he be unable to prevent the supervention of suppuration, he may do mischief by reducing the powers too much. After the leeches have dropped off, a large warm poultice may be applied, or if this cannot be borne, a hot and dry fomentation of chamomile flowers in a flannel bag. The most important fomentation is warm

water sent copiously into the colon, which may be thrown in by means of one of Dr. O'Beirne's rectal tubes. In this manner the impediment may be removed. If repeated glysters be unable to accomplish this, cathartics—as oleum ricini,[a] or infusion of senna with salts[b]—may be administered, in addition, by the mouth.

[a] R.—Ol. ricini f℥ss.
Tinct. opii gtt. xl.—M.

[b] R.—Infus. sennæ f℥xj.
Tinct. sennæ f℥ss.
Magnes. sulphat. ℥ij.—M.
pro haustu.

It can rarely be necessary to have recourse to more powerful remedies than these, repeated every two hours until an evacuation takes place, and aided by the enemata recommended above, or with the addition of castor oil.

R.—Ol. ricini f℥ij.
Enem. domestic. Oij.—M.

The hot bath has been proposed, but it possesses no advantage over hot fomentations, whilst the motion, to which the patient's body is necessarily subjected, renders it objectionable. In the course of a few days, the bowels may begin to be evacuated, and lumps of undigested matter—the cause of the whole mischief—may be perceptible in the discharges.

If signs of suppuration occur, poultices may be applied; and if there be reason to believe, that the parietes of the abscess adhere to the walls of the abdomen, which may be determined by trying whether the latter glide over the tumour, the sooner the abscess is opened the better. Commonly, the tumour gives an emphysematous feel, and if a free incision be made into it, a fetid gas with an offensive fluid will be discharged. This emphysematous condition must be distinguished from the sound rendered on percussion, when the pus has formed on the posterior surface of the cæcum, and pushed the intestine before it. In such case, the intestine may be wounded, as has happened, we are told by M. Grisolle, in one case. After the abscess has been opened, the discharge of its contents must be favoured by placing the patient on his right side, and the system be supported by wine whey; arrow-root, or sago and wine; beef tea, and the preparations of bark.[a] Opiates will likewise be required to produce sleep.

[a] R.—Decoct. cinchon. Oss.
Tinct. cinch. f℥iij.
Syrup. aurant. f℥ss.—M.
Dose, one quarter, four times a day.

Where the perforation takes place into the cavity of the peritoneum, the case must be managed as directed under the head of Perforation of the Intestines. Little, however, can be done except to administer full doses of opiates, (*Pulv. opii*, gr. iiss. vel *Tinct. opii*, gtt. lx. vel *Morphiæ acet.* gr. i.)

Lastly:—Where the abscess is so deeply seated, that an opening into it cannot be made with safety, it has been proposed to endeavour to promote the absorption of the pus by means of repeated blisters, or by moxa applied over the abscess.

b. *Inflammation of the Appendix Vermiformis Cæci.*

Synon. Inflammatio Appendicis Vermiformis Cæci; *Fr.* Inflammation de l'Appendice Cæcal ou Vermiforme; *Ger.* Entzündung der Wurmforsatz des blinden Darms.

The appendix vermiformis, the use of which is so obscure, and its presence even by no means indispensable, communicating, as it does, with the cæcum by means of an open extremity, may have substances impacted in it, which give rise to inflammation and perforative ulceration, attended with fatal consequences; for although adhesion may take place between it and the peritoneum lining the parietes of the abdomen, the more common result is for the abscess to break into the cavity of the peritoneum, and to induce fatal peritonitis.

Diagnosis.—The symptoms, which indicate this affection, are by no means diagnostic. Generally, there is a deep-seated pain in the cæcal region, with more or less fever, vomiting and obstinate constipation. The pain is aggravated by pressure; and careful examination exhibits tumefaction, which may be unhesitatingly referred to the cæcum or to its appendix; at other times, the inflammation spreads over the whole of the peritoneum, so that the diagnosis, when the physician is first called, may be—peritonitis, general or partial.

The position of the appendix is not always the same, a fact, which must be borne in mind. Generally it is curled up beneath the cæcum, concealed by it, and on the outer side of the psoas magnus muscle; and, according to its position, different parts in its vicinity may be prominently implicated.

Causes.—It has been already remarked, that the affection may be induced by small substances becoming impacted in the appendix. In one instance, it was an intestinal concretion; in another, a pin, encrusted with a calculous deposit; in another, a cherry-stone; in another, a grape-stone; and, in another, a tooth, which had been swallowed.

Pathological Characters.—The appendix has been found perforated—a portion having sloughed away—with evidences of a high degree of mischief, the result of inflammation,—as effusion of coagulable lymph, suppuration, or gangrene, in the neighbouring parts. The author has met with many such cases; and a great number are recorded by others.

Treatment.—This is the same as in perforative inflammation of the cæcum. As in all cases of inflammation, likely to terminate in extensive suppuration, in which the recuperative powers of the system have to be greatly exerted, care must be taken not to reduce too far by general bloodletting, too often, or too largely practised in the early stages. Every practitioner is aware of the difficulty of arresting the suppurative process; and, consequently, if the inflammation be not got under by antiphlogistics, in the first few days of the disease, the farther use of depletives should be had recourse to under a wise caution. It is proper to remark, that the disease, at times, occurs very insidiously.

c. *Inflammation of the Colon.*

Synon. Colitis, Colonitis, Enteritis Colica; *Fr.* Colite, Inflammation du Colon; *Ger.* Entzündung des Colons, Dickdarmentzündung.

Inflammation of the colon, like inflammation of the rest of the intestinal canal, may affect either the peritoneal or the mucous coat. When it is seated in the latter, we have the phenomena of dysentery.

1. Inflammation of the Peritoneal Coat of the Colon.

Synon. Serocolitis, Exocolitis.

Diagnosis.—When the peritoneal coat is inflamed, there may be constipation, and the usual signs of exo-enteritis, except, that the mischief is referred to some part of the colon—the ascending, transverse or descending portion, and the affection of the general system is much less than when the same pathological condition is seated in the small intestine. The nearer, too, the inflammation is to the rectum, the less acute and violent is the disease. When in the transverse colon, it is often extremely obscure. Commonly, there is considerable pain upon pressure, with more or less distension of the colon, meteorism, constipation, vomiting, great restlessness, along with the signs of internal inflammation.

When colitis passes into the *chronic state*, we may have all the results of chronic inflammation of the peritoneal surface of the small intestines,—as adhesion of the colon to other viscera, thickening of the parietes of the intestines, with diminution of the caliber,—at times, to such a degree as to occasion obstruction, and death, &c. &c.

Many morbid conditions, that are referred to the stomach or liver, have their seat in the colon. Owing, too, to the attachments of the colon, and its immediate proximity to several important organs, its unequal distension and frequent changes of position, various sympathetic affections are induced, the nature of which is often misunderstood.

Treatment.—This is the same as recommended in acute and chronic inflammation of the peritoneal coat of the small intestines, and in inflammation of the cæcum.

2. Inflammation of the Mucous Coat of the Colon.

Synon. Dysenteria, Fluxus Dysentericus, F. Cruentus cum Tenesmo, Tormina (Celsi), Difficultas Intestinorum, Flumen Dysentericum, Colorectitis, Endocolitis, Esocolitis, Dysentery, Flux, Bloody Flux; *Fr.* Dysentérie, Flux Dysentérique, Flux de Sang; *Ger.* Ruhr.

Dysentery is unquestionably an inflammatory disease of the lining membrane of the colon, and has, therefore, been properly described as a colitis. (*Rostan.*) The inflammation is not, however, generally restricted to the colon, but extends into the small intestines.

1. *Acute form.* **Diagnosis.**—In the milder cases of acute dysentery, the patient complains of tormina, which are not, however, considerable, nor is the pain sensibly increased on pressure. The seat of the pain is commonly towards the rectum, and there is a sense of load in the part, which occasions the patient to make use of frequent and painful efforts—*tenesmus*—accompanied with very slight discharges,—generally, after the first, without any feculent matter, and consisting

chiefly of ropy mucus streaked with blood, and, at other times, of pure blood. These are the essential symptoms; but frequently the irritation is communicated to the urinary organs, and there is a constant desire to evacuate the contents of the bladder. Along with these symptoms, others arise denoting the extension of the irritation to the general system—as pyrexia, with nausea and vomiting: but the general signs of inflammation are not often marked; the patient complains of excessive debility and want of rest; the pulse, although accelerated, is small, and the surface not always hot. On the other hand, the increased heat—if it exists—is partial, and the feet often cold. In some cases of what has been called *Dysenteria simplex*, the fever is slight, or unperceived; the evacuations are passed without great pain or tenesmus, are of a tolerably natural quality, and afford relief; but these are the mildest cases of all, and are scarcely worthy of the name of Dysentery. At other times, the febrile symptoms are well pronounced, and the whole phenomena exhibit active inflammatory excitement—*Febris dysenterica;* whilst at others, again, the accompanying fever is typhoid, or even markedly typhous; and the disease runs its course to a fatal termination in a very short time. In a fatal epidemic dysentery, which supervened on measles, whilst the author resided at the University of Virginia, the disease in some instances terminated fatally in the course of forty-eight hours,—the evacuations consisting of pure blood, and being extremely numerous, and the sinking state supervening rapidly. In these severe cases, which are not unfrequently seen in armies, in establishments in which numbers of persons are crowded together—as in prisons, ships of war, barracks, towns, &c.—the discharges are frequently excessively fetid, and of a peculiar putrid odour; the face soon becomes pinched—*decomposed*, to use a French expression—and the skin is covered with a cold, clammy moisture; at other times, it is dry, rugous, and covered with a kind of varnish,—circumstances which, according to M. Andral, indicate fatal concentration towards the great intestines. This is the *Dysenteria putrida* seu *typhodes* seu *scorbutica* seu *maligna*, *Enterocace;* Ger. *Darmfäule.*

When the thin stools of dysentery are examined, they are found to be either almost colourless or milky; or are coloured red by blood; and they have a peculiar smell, which M. Schönlein regards as quite characteristic. On examining the white or slightly coloured mucous fluid with the microscope, numerous mucus-corpuscles are seen floating about in it. The red-blood discharges also contain an extraordinary number of mucus-corpuscles, with numerous blood-corpuscles, but no—or very few—epithelium scales. In the most inflammatory forms of the disease, portions of false membrane or of exuded plastic lymph are found mixed with the evacuations. (*Simon.*)

Sporadic cases of dysentery, occurring in persons of tolerable constitutions, generally terminate in health in the course of a week or ten days; but, as in the case of endo-enteritis of the small intestine, the inflammation may become chronic, and prove excessively obstinate. When it is about to terminate fatally, death is preceded by alteration of the features, hiccough, meteorism, coldness of the extremities, and the ordinary indications of approaching dissolution. In the Philadel-

phia Hospital, the cases of dysentery are annually numerous; yet, although they occur in persons of by no means the best constitutions, the proportion of deaths is, in the author's experience, not great. Where the disease occurs epidemically, the danger depends upon the character of the epidemic. At times, it is a scourge; and, in the case of armies and ships of war, has proved extensively fatal. Perhaps no disease has more to be dreaded in such circumstances.

Causes.—As is the case with inflammatory affections of other portions of the digestive tube, climate and season may unquestionably be regarded as predisponents. The disease is, indeed, endemic or endemico-epidemic in the torrid regions, and, in the summer and autumnal months in this country. It is rarely sporadic. By some, it has been supposed, that some form of malaria must be associated with heat, in order that it should be induced; but what the nature of this malaria is they do not attempt to pronounce. The fact of the disease raging so frequently and extensively, where numbers are congregated together, would certainly seem to show, that, as in the case of cholera infantum, atmospheric deterioration along with atmospheric heat may be concerned in the causation. The disease affects all ages, and, where it prevails endemically, proves serious, more especially to the aged and the young.

When a favourable atmospheric constitution exists, the use of unripe fruit, and of indigestible aliments of all kinds, or of any agents that can irritate the lining membrane of the intestines, may act as exciting causes.

In evidence of the great effect of elevated temperature in the production of dysentery, it may be remarked, that, according to M. Ozanam, of fifty of the chief epidemics that have occurred at different times in Europe, thirty-six happened in summer, twelve in autumn—making forty-eight in the two seasons; whilst but one occurred in winter and one in spring. In tropical climes, hot and moist seasons are most favourable to it; and, in many of the epidemics that occur in this country, such a union of atmospheric conditions—heat and moisture—has been noticed to prevail. In Bengal, according to Mr. Annesley, of 13,900 persons affected with dysentery—from the year 1820 to 1825—2400 were attacked during the cold season, 4500 during the hot and dry season, and 7000 during the hot and moist.

Putrid emanations, hardened fæces, scybala, moral emotions, excessive fatigue, vicissitudes of temperature, and especially warmth and moisture, &c., have been presumed to act as causes of dysentery, and there may be cases in which they have done so. Dr. Copland speaks very decidedly of the effects of water polluted by matter in a state of decomposition; and declares, that he has had repeated proofs that putrid exhalations may induce the disease. Scybala were at one time supposed to be a great cause of dysentery, and without meaning to deny that they may occasionally be so, for evidence is wanting on the subject, it is certain, that in most cases of epidemic dysentery they are not to be perceived in the evacuations.

It has been a question amongst pathologists, whether dysentery be communicable by contagion. All admit, that it may be associated

with contagious typhus; but some are of opinion, that there is a dysenteric miasm, proceeding from a person labouring under the disease, which is capable of inducing the same disease in another. This opinion has, however, met with much opposition. The question is *sub lite*, but so far as the observations of the author have gone, they are in favour of the negative side of the question.

Pathological Characters. — In recent cases, the large intestines are found to be contracted; and, on the other hand, often very much dilated, if the disease have been of long standing. The mucous membrane is injected and ulcerated, at times, both in the colon and rectum—the muscular coat being implicated in the inflammation, so that the parietes of the intestine are much thickened. The mucous membrane is of a bright red or brown colour in patches. In protracted, or in very malignant cases, deep ulcerations exist, which have been found to run principally in the course of the transverse bands of the colon; and, at times, there is extensive sloughing and mortification of the lining membrane. The follicles of the large intestine are frequently very much enlarged and ulcerated. The parts bounding the valve of Bauhin are often studded with brown or reddish pustules, occasioned by the inflammation of the mucous follicles. The mesenteric glands, corresponding to the seat of inflammation, are occasionally found red and tumefied in the earlier periods of the disease, and black at a later period.

Treatment.—The treatment of dysentery is essentially that advised for inflammation of the lining membrane of the small intestines. In sporadic, and occasionally in endemic cases, it may be advisable to take blood freely from the arm, and to conjoin with it topical bleeding over the region of the colon by means of leeches. In simple cases, the author has found, that by merely keeping the bowels free from the morbid matters that must necessarily be poured into them, by small doses of castor oil, the disease has yielded; but in epidemic cases, the treatment must be regulated by its prevailing characters; and in those cases, that are accompanied by signs of great prostration, and run their course to a fatal termination so rapidly as is sometimes witnessed, the strength may have to be supported, whilst every effort is made to induce a new action in the system by means of mercurials. This is the plan of treatment found most successful in torrid climes. It is a common remark, that if dysentery proves obstinate, it will yield, provided we can only "touch the mouth" with a mercurial. This is not the result of the author's experience. As a general rule it will apply; but he has seen many cases in which the effect of mercury has been induced on the system, and, nevertheless, the disease has proceeded to a fatal termination. On the other hand, in cases of great concentration of action towards the seat of the disease, it is not always easy to induce the peculiar effects of mercury. It may have been administered freely without any sensible result; bloodletting may then be practised, which diminishes the intensity of inflammatory excitement, and favours absorption, and immediately afterwards the effects of mercury are rendered apparent.

Dr. Christison, expresses his belief, that the cure of epidemic dysen-

tery may often be effected by opium alone, begun early and given boldly. In one epidemic, it was prescribed at once in the dose of one, two or three grains every six, four or three hours, according to the urgency of the symptoms, until signs of its narcotic action began to display themselves; and in this way, sometimes twenty or even thirty grains of opium were given in the first twenty-four hours. In several cases, where the treatment was commenced not later than the close of the second day, the force of the disease was at once completely broken, and the only remedies needed afterwards were the continuance of the opium in diminished doses, and restricting the patient to pulpy solids as diet. The author has often seen the excellent effects of opium in this as well as in other inflammations, given in sedative doses; but caution will have to be used that it be not pushed too far.

For the external and internal remedies to be had recourse to in dysentery, we may refer to what has been said under Inflammation of the Mucous coat of the Intestines, acute form, and under Diarrhœa —merely remarking, that as the inflammation is here seated in the large intestine, and at times even in the rectum, enemata—opiate or astringent—can be readily made to come in contact with the parts affected; the impressibility of the canal is, however, so great, that they are generally returned immediately.

The most opposite remedies have been advised, but the only management that can be satisfactory is one based upon general principles. The disease is really an inflammation; but, as in the case of inflammation of any other part, it may not always demand antiphlogistics. On the contrary, as before observed, inflammatory affections of mucous membranes require, at times, a treatment that is astringent and excitant. This is especially the case with chronic inflammation of those parts. Dr. Marshall Hall affirms, that he has watched a severe epidemic in three successive years, and that all "violent remedies" appeared to him to do harm; but he has not specified those that he considers to be violent.

It has been proposed by M. Mondière to administer albumen in dysentery, under the view of supplying the blood with the albuminous principles that are thrown off in large quantities in the evacuations.

Take of *Water*, two pounds; *Whites of eggs*, six; beat them well together; then strain and add three ounces of *Sugar*, and as much *Orange-flower water* as will flavour it. Three or four bottles of this mixture must be administered in the course of the twenty-four hours. It may also be given in injections.

The plan has been practised by others, and, they affirm, with great success; and there is no question, that in cases of simply dysentery, it may be as effectual as the bland mucilaginous system of management, generally pursued in such cases; but it can scarcely be found to accomplish more.

2. *Chronic form.*—The chronic form of dysentery is usually a sequel to the acute. In such cases, the tenesmus gradually passes away; the tormina are no longer violent; but the evacuations are numerous, and preceded by obscure pain and flatulency. They still consist of mucus mixed with very little feculent matter, and often with a purulent secretion. The whole system of nutrition, in the majority of cases, becomes affected; emaciation makes slow but sure progress, and death is pre-

ceded by signs of loss of balance between the serous exhalents and absorbents,—as indicated by general or local dropsy. The disease is extremely difficult of cure, being dependent upon thickening, softening, or ulceration of the intestines;—organic changes, which do not admit of removal by medicine, and which are generally inconsistent with prolonged existence. It has usually, indeed, a fatal termination.

The *treatment* is essentially that of inflammation of the mucous membrane of the small intestines—chronic form.

II. PERFORATION OF THE INTESTINES.

Synon. Perforatio Intestinorum, Enterobrosis, Enterorrhexis; *Fr.* Perforation des Intestins; *Ger.* Durchlöcherung der Gedärme.

Diagnosis.—If, according to M. Louis, in the course of an acute disease, and under unexpected circumstances, violent pain of the abdomen suddenly supervene, and this pain is increased by pressure, and is accompanied by speedy decomposition of the features, nausea, and vomiting, there is reason to believe in the existence of intestinal perforation. The pain extends rapidly over the whole of the abdomen, and diminishes, at times, so much as to remove all apprehension on the part of the patient and his attendants; but the physician should not be easy whilst the face remains pinched. The symptoms are commonly deathlike, from the very first. The pulse is not immediately affected, but soon becomes quick, feeble, and irregular in its measure, intermitting, thready, and afterwards no longer to be felt.

The disease generally terminates fatally in from twelve to thirty-six hours; sometimes, more speedily.

Perforation has usually been met with within twelve inches from the termination of the ileum in the colon; the pain, indeed, generally commences in the locality of the cæcum, or near the right iliac fossa.

Causes.—It may be owing to the softening of the mucous membrane; (*Enteromalacia, Enteromalaxia;* Fr. *Ramollissement de l'Intestin;* Ger. *Darmerweichung*); to ulceration; to gangrene, induced by strangulation; and it has been supposed by some, that it may be caused by worms in the intestines. A distinguished writer, J. P. Frank, however, affirms, that during fifty-four years' practice, although he had opened several thousand bodies, he had never met with one instance, which could be properly attributed to them. Many cases are on record, in which worms have been discharged from abscesses communicating with the intestines, and of worms found in the cavity of the abdomen with the intestines perforated; but it is probable, that the perforation, in all these cases, was owing to ulceration of the intestines—which might or might not have been primarily induced by the presence of worms—and not by any direct perforation by these entozoa. In most of the instances that have been recorded, the morbid appearances have confirmed this view, the openings of the intestines presenting a considerable loss of parts, as if occasioned by some morbid and destructive process. Such is the view of some of the best medical helmintholo-gists. M. J. Mondière affirms, that it is not very rare to see tumours developed on some part of the abdomen, and especially about the inguinal and umbilical regions, which, when opened, give exit to asca-

rides lumbricoides in greater or less quantity; but with us, certainly, such a pathological condition is extremely uncommon. When perforation takes place in this manner—indeed, in all cases in which abscesses form, that communicate externally, and through which fæcal matter is discharged—a tumour appears, which subsequently breaks through the abdominal parietes, or is opened. An interesting case of the kind, which fell under the author's care at the Philadelphia Hospital, and in which there was also tubercular peritonitis, has been described by an intelligent resident physician, Dr. Vedder, of Schenectady, in the *American Medical Intelligencer* for Nov. 1, 1839, p. 229, of which the author was editor.

Pathological Characters.—Perforation of the intestines is perhaps always—some say always—in the centre of an ulceration. On careful inspection of the mucous membrane, oval patches, more or less prominent, are found; and, in the midst of them, ulcerations, some of which may have perforated the walls of the intestine. The patches are either formed of the mucous membrane, or of agglomerated mucous follicles. They are usually about a line in thickness, and are of a grayish colour, spotted with blue. The submucous tissue of the muscular coat is, at times, in a pathological condition. The margins of the ulcers are defined,—cut, as it were, by a punch. There is never any gangrenous appearance or odour. Besides the evidences of ulceration and perforation, there are those of inflammation of the peritoneum, induced by the extravasation—if it may be so termed—of the contents of the intestines; and the contents themselves are found in the peritoneal cavity. The peritoneum frequently offers considerable resistance to perforation.

Treatment.—This is the same as in cases of Perforation of the Stomach; in other words, altogether palliative.

III. DIARRHŒA.

Synon. Enterorrhœa, Alvi Profluvium, Alvi Fluxus, Ventris Profluvium, Cœliorrhœa, Incontinentia Alvi, Defluxio Alvi, Looseness of the Bowels, Lax; *Fr.* Diarrhée, Dévoiement, Catarrhe Intestinal, Flux de Ventre, Courante; *Ger.* Bauchfluss, Diarrhöe, Durchfall, das Abweichen.

Diarrhœa is not admitted by all pathologists to be a distinct disease; and there is no question, that it may arise, like gastrorrhœa, from morbid conditions different from inflammation. The mucous membrane, as has been more than once remarked, is a prolongation of the external cutaneous surface, and similar to it in its anatomy and physiology, as it probably also is in its pathology. We can, consequently, readily comprehend, that the exhalation, which is effected from it in health, may be greatly augmented; or, that under sources of irritation, certainly not always of inflammation, the different secretions, accomplished by the membrane, may be increased in quantity, and that owing to the extension of the irritation to the muscular coat, the peristaltic action may be likewise rendered more active. Diarrhœa may, indeed, be defined—an augmented secretion from the mucous membrane of the intestines, with increased peristaltic action of the canal; these symptoms not being attended, in simple cases, with evidences of positive inflammation. We notice diarrhœa occasionally supervene in

persons labouring under anxiety, or some powerful emotion, as others perspire freely under the same circumstances. In neither case, can inflammation explain the phenomena.

1. *Acute form.* **Diagnosis.**—Diarrhœa cannot be mistaken. The number of alvine evacuations is greater than usual, and they are of a more fluid consistence. Their character varies considerably; sometimes exhibiting a predominance of acid, especially in children; in others, of bile; and in others again, of both. The remark, previously made, must be borne in mind, however,—that when muriatic acid is mixed with healthy bile, a green colour results; and, hence, the therapeutist may have to correct the too great secretion of acid, rather than the vitiated secretion of bile.

When the evacuations appear to contain much bile, the irritation that gives rise to the diarrhœa is generally seated at or near the portion of the tube into which the ductus communis choledochus opens; and if it should continue for any length of time, the secretion from the liver may be permanently deranged. It is now admitted, that the most certain mode of rendering evacuations bilious is to administer cathartics which act upon the upper part of the small intestines, and which, by their excitation, conveyed by continuous sympathy to the liver, cause an increased and a modified secretion from that viscus. Hence, the common course of treatment, at one time so much advised in dyspepsia, was well calculated to produce the vitiated condition of the secretions which it was prescribed to remove. A blue pill or calomel pill, taken night after night, and followed up by repeated doses of saline cathartics in the morning, is signally liable to this objection. The rule, too, of administering cathartics in cases of diarrhœa, so long as the fæces passed are offensive, has to be received with caution for the same reasons. At the lower part of the ileum and commencement of the colon, peculiar follicles exist, which secrete a fluid, possessed of the fæcal smell and characters; and if cathartics be administered sufficiently often to keep up an excitement in those follicles, we may have offensive evacuations induced by the remedial agents themselves.

In simple diarrhœa, mucus may be mixed in considerable quantities with the evacuations, but pain and tenesmus are rarely concomitants; nor are there usually any symptoms which indicate that the irritation extends to the general system. In those cases of diarrhœa that arise from a surfeit—the *Diarrhœa stercoraria* or *D. crapulosa;* Ger. *Kothiger Durchfall*, (Bartels,) vomiting is at times an attendant: in such cases, however, the disease is more properly cholera morbus. In some cases, too, more or less febrile irritation prevails, constituting the acute form of *enterorrhœa*, of some.

The duration of an ordinary acute attack of diarrhœa is a few days; generally, perhaps, but a day or two; and the usual termination is in health: it may, however, end in endo-enteritis; and, at times, it passes into the chronic form.

Acute diarrhœa is very common in childhood. Infants rarely escape attacks of bowel complaints, in which the evacuations are of a green colour and acid smell. The number of evacuations may be

very great—from twelve to twenty a day—yet the disease may pass off, without materially affecting the general condition of the child. In this case, the stools may be at first feculent; but they soon cease to be so, and nothing but a greenish fluid may be apparent on the diaper. In other cases, and in somewhat older children, the secretion of mucus is inordinately increased, and after the discharge of feculent stools for a day or two, scarcely anything but mucus may be passed, which, if it be discharged into a vessel containing water, will be observed at the bottom. In this case, there is usually inflammation of the lining membrane of the tube. In the same pathological condition, frothy evacuations are not uncommon attendants; but no positive deduction can be made from the evacuations alone. In the diagnosis, all the other accompanying symptoms must be attended to. When there is great irritation, the stools are either squirted out forcibly, or they pass away in small quantity with much straining.

One of the most dangerous varieties of diarrhœa is that, to which, in England, the term *watery gripes* has been commonly given. By some, it has been considered to be synonymous with *lientery;* but it is not so; for although the food or drink rapidly passes through the bowels, it generally appears to have undergone some change; and often resembles moss-water. From the commencement of this form of diarrhœa, the secretion from the mucous membrane is excessive, and consists chiefly of watery exhalation, although at times this is mixed with an increased quantity of mucus: the evacuations are accordingly very watery and frequent; the child is extremely restless; the skin dry; the features soon become pinched; the emaciation and prostration are excessive, and if the disease be not speedily arrested, it terminates fatally.

In cases of great irritability of the canal, such as is present in cholera morbus, we notice a true state of lientery,—food, when taken, being rapidly sent on through the whole of the digestive tube, and appearing, unchanged, in the evacuations.

Causes.—Time of life certainly offers a predisposition to diseases of the lining membrane of the digestive tube. Infancy is extremely liable to the more acute forms of diarrhœa, and old age to the more chronic. Sex, too, appears to act in the same manner, women being more subject to constipation, and this probably owing to their sedentary occupations. Climate and season act, likewise, in the way of predisposition, bowel affections being much more frequent in the torrid regions than in the temperate or frigid; in like manner, diarrhœa is so common during the heat of summer, as to be called, in this country, *summer complaint,*—a term, however, which is often made to include dysentery and cholera infantum. When any of these predispositions exist, the disease is readily induced by indigestible substances taken as food; and hence our summer and autumnal fruits, unless perfectly ripe, often act as exciting causes, and confirm the truth of the old saying of the school of Salernum:—

"Cave autumnos fructus,
Ne sit tibi luctus."

Exposure to draughts of cold air, or to cold in some form, when the

body is heated, has been regarded a great cause of this as of other diseases; but it is not unfrequently induced by the erethism of the dermoid tissue, caused by the rays of the summer or autumnal sun beaming on the body. In the southern parts of this country, every one who is not acclimated, should, for this reason, avoid too much exposure.

The use of spoonmeat is perhaps the most frequent cause of diarrhœa to the unweaned infant; and hence, also, we can understand, why it should supervene so often soon after weaning, especially in an unfavourable season, as in summer or autumn—when the child has been deprived of a diet congenial to it, and put upon one that is not so readily digestible. It may likewise arise from the nurse's milk not agreeing with the child, or from the irritation of teething. In older children, the causes are, generally,—improper diet of some kind, especially of acescent and unripe fruits in their season, or inordinate quantity of food of any kind, or moral emotions. It is not uncommon to see it supervene on a sudden fright, as from a fall. Previous constipation, owing to the retained fæces irritating the lining membrane, or a delicate condition of the bowels natural to the individual, or too active purgation, may likewise give rise to it at any age.

Redundancy and improper quality of the bile have been looked upon by many authors as common causes; but, from the remarks already made, the character and quantity of the hepatic secretion may be modified by the condition of the lining membrane, and may therefore be the effect, rather than the cause, of the diarrhœa. Moreover, secretions rarely irritate the parts over which they naturally pass, when those parts are in health; but if the parts become diseased, they may then be the cause of irritation; hence it is, that *ardor urinæ* is not a sign that the urine is hot—as the term would import—but that the lining membrane of the urethra is inflamed, and, being inflamed, healthy urine occasions a sensation of heat when it passes over the morbid surface.

Pathological Characters.—In cases of diarrhœa that have terminated fatally, without inflammation of the lining membrane, the membrane may be found devoid of change both in colour and consistence; or, instead of being red, it may be pale, indicating rather an anæmic condition. In the large mass of cases, however, in which persons have died during an attack of acute diarrhœa, evidences of endo-enteritis have been discoverable.

Treatment.—An ordinary case of acute diarrhœa generally passes off in a day or two, without demanding much attention on the part of the practitioner or patient. If it have arisen from errors in diet, it may be advisable to administer an emetic,[a] which may act beneficially in two ways; first, by removing any undigested or improper aliment that may be in the stomach; and secondly, by its revellent operation, if the source of irritation be seated low down in the digestive tube. It was at one time the custom to administer no therapeutical agents in diarrhœa. The disease was looked upon as an effort of nature, not to be interfered with; and at the present day, there are still some who embrace a similar opinion. Others, again, have adopted an opposite

view, and advised, that astringents should be given from the very commencement; of the two, the latter is the more manifestly erroneous, and mischievous in its consequences. The disease is usually one of irritation, and the exciting cause, as has been shown, is often seated in the intestines themselves; accordingly, as an almost universal rule, gentle cathartics must be employed in the first instance, and be repeated if necessary,[b] and astringents should not be used, unless the disease should persist.

[a] R—Pulv. ipecac. gr. xx.
Antim. tart. gr. ij.—M.

[b] R.—Ol. ricini f℥i.—f℥iij.
Tinct. opii gtt. x.—M.

In children, the same course is demanded, perhaps more imperiously, owing to the great predominance of acid in them. To neutralize this, a laxative which absorbs the acid, and forms a cathartic salt, may be advisable; (*magnesia*, or *magnesiæ carbonas*,) or any of the milder cathartics may be given, as the oleum ricini, or rhubarb, alone or associated with magnesia.[a] With the same view, the carbonated alkalies are sometimes administered.

[a] R.—Rhei pulv. gr. ii.
Magnes. gr. v.—f. pulvis ter die sumendus.
For a child three or four years old.

By this simple treatment, the ordinary cases of acute diarrhœa, both in the adult and child, are capable of being speedily removed; but in climates and seasons when the disease is endemic or epidemic, still more care is demanded. If the laxative treatment, inculcated above, should not prove effective; and, still more, if the evacuations continue as frequent, whilst they are extremely offensive, and unnatural in their appearance, the laxatives must be repeated; for it must be especially borne in mind, that an increased number of evacuations may take place, owing to the retention of fæcal matter in some portion of the alimentary tube. Diarrhœa may thus be a symptom of constipation, and it is not until the state of fæcal retention has been removed, that a cure may be effected. In such cases occurring in children, the author early in practice observed excellent effects from the use of aloes given in the manner referred to under Constipation.

The cases of acute colliquative diarrhœa, which supervene in phthisis, belong properly to ileitis or endoenteritis of the small intestine, and have to be treated accordingly. The common plan is to exhibit an opiate, which has the effect of allaying the irritation in some degree; and, occasionally, the *mistura cretæ* of the pharmacopœias is made the constituent of the prescription;[a] or the infusion of catechu or kino, or of some other vegetable astringent; or the mineral astringents, recommended under the chronic form, may be administered, along with revellents, as blisters or sinapisms to the abdomen, if necessary; but it need scarcely be said, that no permanent benefit to the primary disease, phthisis, can be expected from the administration of these agents. It is only the symptom, the diarrhœa, that we combat by them.

[a] R.—Mist. cretæ f℥vj.
Tinct. opii gtt. xl.—M.
Dose, a tablespoonful after every liquid evacuation.

In children, where the disease continues violent, notwithstanding the

use of the laxatives recommended above, small doses of calomel[a] may be given, if the child be under two years of age. Above this age, the infantile constitution is apt to be easily affected by mercury; but, under it, this rarely happens. A distinguished English practitioner, Dr. John Clarke, affirmed, that he never saw but one case of a child, under two years of age, affected by mercury. It certainly is a rare event, as the observation of the author has sufficiently satisfied him.

[a] R.—Hydrargyr. chlorid. mit. gr. vj.
Sacchar. ʒi.—M. et divide in pulv. xij.
Dose, a powder every three hours.

Should the diarrhœa still continue, a mixture of chalk and laudanum, in doses suited to the age of the patient, may be prescribed; or pure argil,[a] with opiate frictions[b] over the abdomen; or sinapisms; or a *maceratum* of cloves in whiskey, which is a common remedy with the extra-professional. With these means, may be combined injections of starch and laudanum, or of nitrate of silver.[c]

[a] R.—Argil. pur. ʒss.
Acaciæ ʒi.
Sacchar. alb. ʒij.
Aquæ anisi f ℥iss.—M.
Dose, for a child two years old, a teaspoonful or two.

[b] R.—Lin. saponis. comp. f ʒiss.
Tinct. opii f ʒij.—M. et fiat linimentum.

[c] R.—Argent. nitrat. gr. x.
Aquæ Oij.—M.
For an adult.

In the acute forms of diarrhœa in infants, in which the surface of the abdomen feels hot and dry, somewhat tender and full, with great irritability of the bowels and frequent watery evacuations, changeable in colour, and offensive, with several symptoms of a febrile state, Mr. M'Diarmid of Canada, has seen, in some cases, an almost magical effect, in a few hours, from an iodine liniment, formed of a scruple of iodine to an ounce of olive oil, freely smeared over the entire surface of the abdomen. The operation is repeated as soon as the liniment is absorbed, and the skin has again become dry, or almost so. In infants, two or three applications may, according to Mr. M'Diarmid, be safely made in the twenty-four hours; and in adults, it may be used more frequently, if necessary.

In all cases, whether occurring in the adult or infant, but especially in the latter, the application of a flannel bandage around the abdomen is to be recommended.

It need scarcely be said, that the diet must be regulated; and this, as before remarked, is often sufficient to remove the disease. Barley-water or gum-water may be allowed for drink, and Iceland or Irish moss, arrow-root, sago, or tapioca, with or without milk, may constitute the diet. Well-boiled rice is one of the most digestible aliments, and is, therefore, very appropriate. It may be mixed with a little gravy, from which the fat has been carefully separated, or with weak chicken soup. The succulent vegetable, and unripe fruits should be proscribed.

As soon as the appetite returns, animal food—as the tender part of the sirloin of beef, or boiled mutton or chicken—will be digested more readily than strong soups, which are frequently directed in bowel complaints, but are not more appropriate in diarrhœa than they are in dyspepsia.

2. *Chronic form.*—Diarrhœa, after having existed for some days in the acute form, may become chronic, and an increased discharge from the mucous membrane may continue, similar to the gleet that succeeds to the inflammation of mucous membranes in general. At other times, the symptoms are, from the first, those of chronic diarrhœa, if we may be permitted to term a disease chronic, in which time is no element. In such cases, great impressibility of the digestive tube exists, so that any error of diet reproduces the disease after it appears to have yielded. As in chronic dysentery, the patient frequently becomes greatly emaciated, and the supervention of positive endo-enteritis and consequent ulceration have to be apprehended. It is often, indeed, a matter of extreme difficulty to decide, whether the disease consists in mere irritation of the lining membrane of the tube or in inflammation, or ulceration, or both.

Allusion was before made to the diarrhœa which supervenes on weaning, and which may become chronic, so as to assume all the characters of the *Weaning brash*, of Cheyne or the *Maladie de Cruveilhier*. The child in these cases wastes away perceptibly, becomes peevish, and is desirous of being always at the breast; or, if weaned, is voracious for the drink presented to it. Sooner or later, stupor supervenes, the little patient lies with its eyes half closed, and turned upwards, and gradually sinks, unless the means adopted for its relief be successful.

Attention has been drawn to a chronic form of diarrhœa, dependent upon ulcerations of the rectum, at a short distance from the anus, which may be seen by the aid of the speculum. They occur chiefly in those of broken down constitutions, and in such as have taken a great deal of mercury. The symptoms are irritation of the colon, tenesmus, tormina, frequent evacuations, and generally, during the straining a little blood is passed. Dr. Stokes advises, that the rectum should always be examined, when diarrhœa has been of long standing; has resisted a great variety of treatment; has been combined with tenesmus, and a desire to remain on the night chair after an evacuation, which shows irritability of the lower part of the tube, and when the health of the patient does not appear to be so much affected as it naturally should be, where there has been long-continued disease of a large portion of the great intestine. Since the author's attention has been directed to this pathological cause of chronic diarrhœa, he has met with several cases, which have been treated successfully by the local applications to be mentioned presently.

Pathological Characters.—The appearances on dissection, in chronic diarrhœa, are more mixed than those we meet with in the acute form; for the reason, that we have, in addition, the evidences of the pathological conditions that supervene in the progress of the disease. In the epidemic diarrhœa, described by Cruveilhier, a "gelatiniform" disorganization and thickening of the coats of the intestine, both with and without perforation, was perceived, which was sometimes seated in the small intestine—in other cases, in the large; but almost always the stomach was observed to be affected. In the part where the softening was situate, there was no trace of inflammation, nor any altera-

tion of colour. Cruveilhier, however, subsequently mentions a black hue of the vessels surrounding the diseased portion, which occasionally communicated itself to the disorganized parts.

Treatment.—We may presume, that the laxative and revellent course, and the attention to diet, recommended when treating of the acute form, have been prescribed, and that the use of chalk and opium, and of starch and laudanum clysters, has been tried in vain. The practitioner has now recourse to astringents, or to excitants proper, which are calculated to induce a new action in the morbid parts, or which, by reacting upon other portions of the frame, may prove salutary by virtue of their revellent operation. Astringents and excitants must always, however, be employed with caution, although, in very urgent cases, it may be even necessary to have recourse to the most powerful, administered both by the mouth and rectum, and their agency may be augmented by the addition of opium to allay the irritability of the canal. Of the vegetable astringents, those most frequently employed are catechu and kino; the former, however, possesses all the essential properties of the latter.

℞.—Infus. catechu comp. f℥vj.
Tinct. catechu f℥ij.—M.
Dose, a tablespoonful every three or four hours.—Or,
Pulv. kino comp. gr. v.—xx. four times a day.

Of the mineral astringents, there are several, which are prescribed. The acetate of lead is preferred, by many, in all cases of profluvia from the bowels. Should intestinal pain occur during its administration, similar to that of the painter's colic, it must be discontinued.

℞.—Plumb. acetat. gr. viij.
Opii pulv. gr. j.—M. et divide in pil. iv.
Dose, one, four times a day.

The mineral acids have been highly recommended, and especially the nitric, in combination with opium, forming a nitrate of morphia, which is the basis of a mixture, attributed to Dr. Baillie, of London,[a] and of one, which has been much used in this country under the name of *Hope's mixture*, so called from its proposer.[b]

[a] ℞.—Infus. simaroub. f℥iss.
Acid. nitr. dil. gtl. iv.—vj.
Syrup. caryoph. f℥ss.
Tinct. opii gtt. vj.—M.
To be taken three or four times a day, in the case of an adult; two or three teaspoonfuls, in the case of a child.

[b] ℞.—Acid. nitros.* f ℥i.
Aquæ camphor. f℥viij.
Tinct. opii gtt. xl.
Dose, a fourth part every three or four hours.

This last has been highly extolled by some practitioners in dysentery; but it has not succeeded more frequently with the author than other remedies suggested by the nature of the case. In similar cases, the persesquinitrate of iron has been strongly advised of late years, (*Liq. ferri persesquinit.* gtt. x.—given several times a day in gruel, gradually augmenting the dose.) It is said to have succeeded when other remedies had failed. Alum has likewise been administered,[a] as

* Mr. Hope says *Acidum Nitrosum*, probably of the old Edinburgh Pharmacopœia; but the *Acidum Nitricum* of the Pharmacopœia of the United States was employed in many of the successful cases.

well as nitrate of silver,[b] subnitrate of bismuth, in which Mr. Rayer has much confidence, and various other mineral astringents; but those we have mentioned are generally preferred, and are adequate to all purposes. Many of them, indeed, belong to the class of tonics, and seem to act altogether by the new impression which they make upon the mucous lining of the stomach. Amongst the tonics, recommended of late years more especially, may be mentioned *artemisia vulgaris*, the resinous extract of which has been used successfully in Germany; *carbo animalis*, and *ferri ferrocyanuretum*, (gr. ij. gradually increased to gr. vj., three times a day); but there is no reason for believing, that any of these agents are of superior efficacy to other vegetable and mineral tonics.

[a] ℞.—Aluminis pulv. ʒss.
Opii pulv. gr. ij.—M. et fiant pulveres vj.
Dose, one, every three or four hours.

[b] ℞.—Argenti nitrat. gr. ss.—ij.
Micæ panis gr. iij.—M. et fiat pil.
Dose, one, every four or five hours.

In some cases of obstinate chronic diarrhœa, Sir James Eyre has found marked advantage from the use of oxide of silver, in half grain doses twice a day.

Of the local excitants, employed in diarrhœa, the balsams, and turpentines have long been used. Of these, the copaiba, and the oil of turpentine are almost alone employed at the present day. Great efficacy has been assigned to the copaiba. Its action is probably revellent also. It affects the urinary organs, and in particular constitutions induces great disorder of the mucous membrane of the stomach, and urticaria. The oil of turpentine, which, likewise, acts as a revellent as well as an excitant to the lining membrane of the digestive tube may be given in the same way. Where the evacuations are offensive, it may be associated with the oleum ricini.[a]

[a] ℞.—Copaib. gtt. x.—xxx.
Tinct. gentian. fʒj.
Aquæ fʒj.—M. et fiat haustus.
To be given three or four times a day.

[b] ℞.—Ol. terebinth. fʒss.
— ricini fʒij.
Mucilag. acaciæ fʒss.
Aquæ menth. piperit. vel
Aq. cinnam. fʒvss.—M.
Dose, one quarter, four times a day.

Within the last few years, the peculiar agency on the nervous system, which the nux vomica and its active principle—strychnia—are capable of exerting, has been employed, and especially in those cases that appeared to proceed from morbid irritability of the nerves of the stomach. Either the powered nux vomica,[a] or the alcoholic extract,[b] may be given.

[a] ℞.—Acaciæ
Sacchar. ää gr. xij.
Nucis vomicæ, in pulv. gr. iij. M.
To be repeated according to circumstances.

[b] ℞.—Ext. nucis vomic. alcoholic. gr. ij.—vj.
Aquæ cinnam. vel
Aquæ menthæ fʒvj.
Mucilag. acaciæ fʒss.—M.
Dose, two spoonfuls, six or eight times a day.

The salts of strychnia—the acetate, the nitrate, and the sulphate—are preferable to the pure strychnia, which is nearly insoluble, yet in this country and in Great Britain, it is almost always prescribed.[a] It has been highly extolled by many practitioners, and one, Dr. Ryan, remarks, that he has repeatedly known a few of the pills, the formula

for which is given below, check a profuse diarrhœa with rice-coloured evacuations, even when the extremities were blue, in malignant cholera.

[a] R.—Strychniæ gr. i.
Confect. rosar. vel
Micæ panis ℥ss.—M. et divide in pil. xij.
Dose, a pill, three or four times a day.

It will have been observed that, in most cases, opiates are combined with the other remedies, in cases of diarrhœa both acute and chronic. They are, indeed, valuable agents in those affections, and in all the morbid conditions of the mucous membrane that are accompanied by discharges; the practitioner bearing in mind, that the essential agency of a large dose of any preparation of opium is sedative, whilst in smaller doses it is excitant. In many cases, small doses of opium, or of morphia, or its salts, are of themselves sufficient, with properly regulated diet.[a] The acetate of morphia is often added to glysters, in chronic diarrhœa,[b] with the same view as the laudanum is added to the starch glyster.[c] The glyster may be repeated twice a day.

[a] R.—Pulv. opii gr. iij.
Ext. gentian. ℥ss.—M. et divide in pil. xij.
Dose, one, four or five times a day.

[b] R.—Morphiæ acet. gr. i.—ij.
Decoct. amyli Oj.—M.

[c] R.—Tinct. opii gtt. lx.
Decoct. amyli Oj.—M.

In all forms of bowel affections, demulcents are employed, but chiefly as articles of diet. Flaxseed tea, or infusion of the slippery elm,[a] or of the benne—*sesamum orientale*—made by stirring one or two fresh leaves in half a pint of cool water, or the dried leaves in hot water, may be allowed for common drink; and the various farinaceous and mucilaginous preparations, advised under the head of Acute Diarrhœa, may be prescribed as diet.

[a] R.—Cort. ulmi ℥j.
Aquæ ferventis Oj.—M.

Where the discharges are kept up by ulceration of the rectum, near the verge of the anus, the ulcers, where practicable, may be touched by lunar caustic, or by a strong solution of the nitrate of silver:—

R.—Argenti nitrat. gr. iv.—xx.
Aquæ destillat. f℥j.—M.

Such are the general remedies to be advised in cases of chronic diarrhœa, which often proves unmanageable; and, at times, after it has resisted the best-directed remedies, yields to time, aided by very simple treatment. Chewing rhubarb, or cinchona, by impressing the upper portion of the canal more especially, has appeared, in rare and obstinate cases, to break in upon the morbid catenation lower down, and to effect a cure.

Warm clothing, friction over the abdomen, especially with the iodine liniment, recommended by Mr. M'Diarmid, (p. 121,) occasional blisters, and affecting the mouth slightly by mercurials, have exerted a beneficial agency; but where every other remedy fails, the thorough change produced by travelling, air, exercise, society, and scenery, will, at times, succeed in cases that have proved almost hopeless. If the patient desire to visit the mineral springs, let him be cautioned to

avoid those that are cathartic. Simple sulphur waters have been found serviceable, but they must not be taken in quantity sufficient to irritate a lining membrane already too impressible; and in all cases, care must be taken to avoid irregular exposures, and to prevent their effects—if they be inevitable—by the use of flannel next the skin. The Russian belt, by exerting methodical compression, has been found of benefit in such cases. It is the change effected by travelling, and not the water at the springs, on which the physician must generally rest his expectations of cure. Such, too, may be mainly the case where benefit has been derived from hydropathic processes. Yet we can understand that the powerful revulsion effected by their agency may prove, at times, an effectual remedy, where other means have failed.

The diarrhœa of infants must be treated upon the same principles. In the *Atrophia ablactatorum* or *Weaning brash*, Dr. Cheyne found the treatment by small doses of calomel, given every night and morning, or every night for a week or ten days, to be most successful. The occasional exhibition of clysters of thin starch and laudanum, or of small doses of opiates combined with the warm bath; the application of a flannel bandage, and a properly regulated diet, will usually be found the most successful method of management. In the *Maladie de Cruveilhier*, the most efficacious plan was found to be the use of opiates and warm bathing, conjoined with properly regulated milk diet. An eighth of a grain of opium administered morning and evening, and, in some cases, every four or five hours, in a glyster of aniseed tea, jelly, or starch, sometimes speedily arrested the diarrhœa, and afforded inexpressible relief.

Adipous Diarrhœa.

Synon. Diarrhœa adiposa, Fatty Discharges from the Bowels, Molten Grease; *Fr.* Gras Fondure.

A discharge of fatty matter has been observed from the bowels, sometimes in a fluid state, and at others in the form of fatty concretions. Many cases of the latter are on record; and of late years, the attention of pathologists has been specially directed to the former. In one case, discussed by Sir Everard Home, the cause of the oleaginous discharges seemed to be evident. The lady, before their appearance, had regularly taken olive oil for the purpose of allaying severe pains in the stomach, which were ascribed to the passage of a gallstone. The discharged fatty matter was of a globular form, varying in size from that of a small pea to that of a moderate grape, of a cream colour and slightly translucent, of sufficient consistence to preserve its form, and to bear being cut with a knife like soft wax. A more interesting question of pathology appertains to discharges of fat when no oleaginous substances have been taken;—in other words, to those cases in which the fat must have been formed at the expense of the system.

The annals of medical science contain many examples of fatty discharges from the bowels. Sometimes, the discharge is in the form of oil or semi-concrete matter, floating on the top of the fæces, and possessed of a fetid odour. The quantity evacuated differs of course greatly. In one case, which occurred to Dr. J. B. Jackson, of Boston,

it amounted, on an average, in the twenty-four hours, to about eight ounces during more than four months. A specimen examined by Dr. Prout possessed all the properties of human fat; and in another case, the oily matter is said to have formed good soap on admixture with an alkali. Some fatty concretions analyzed by Lassaigne and L. Gmelin, had the following constituents: seventy-four parts of an acid fatty matter, in which stearin predominated, elain and a peculiar acid; twenty-one parts of a substance analogous to fibrin; four parts of phosphate of lime, and one part of chloride of sodium. In another case, there were, in one hundred parts, sixty of matter similar to spermaceti; thirty of phosphate of lime; eight of animal matter, and two of loss.

In many of the cases of fatty discharge, there was concomitant disease of the liver, pancreas or duodenum; so that it was imagined the anomalous secretion might be the product of the pancreas or the liver. On the other hand, in some of the cases on record, the ducts of the liver and pancreas were so obstructed as to preclude the idea of its being the product of either of these viscera; and, moreover, it has been seen in cases in which there was no reason to believe in the existence of serious disease of those organs. At the age of three years, a little girl was observed to discharge something from the bowels as she walked across the room; this, when examined, was found to be fat in a liquid state, which concreted when cold. "Ever since that time to the present," (a period of eighteen months,) "she has voided," says Dr. Babington,—the respectable narrator of the case,—"at intervals of ten or fourteen days, the quantity of from one to three ounces, sometimes pure, at others mixed with the fæces: when voided, it has an unusually yellow tinge, and is quite fluid, like oil. Her appetite is good, as well as her spirits, and her flesh firm, her belly rather tumid but not hard." In other cases, the disease appears to have occurred during phthisis, hysteria, and other affections; in some instances, oil was discharged from the bladder likewise, and fatty concretions have been taken from the vagina. One of these was examined chemically by Dr. Martius, jr., and found to be composed of fat with some traces of salts.

These facts sufficiently establish, that under certain circumstances, and, doubtless, under the influence of particular diseases of the neighbouring organs, the gastro-enteric and other mucous membranes may secrete fat from the blood, as the physeter macrocephalus occasionally secretes an enormous quantity of fat under the form of ambergris:—as much, it is asserted, as one hundred and eighty-two pounds have been found in the body of one of these animals.

Treatment.—In complicated cases of discharge of fatty matter from the bowels, as in some of those that have been reported, in which the liver or the pancreas, or the biliary ducts, or the duodenum were extensively affected with disease, the case may be regarded as unmanageable; but where the secretion is vicarious, and consists simply in the mucous membrane of the intestine secreting a fluid unusual to it, it may admit of remedy. It has been asserted, that our practice cannot be anything but empirical, until we have more light thrown upon

the subject; but it is not probable, that farther investigation will enlighten us any more than in other cases in which we know that organs of secretion separate from the blood matters which they do not ordinarily secrete, as where bone is copiously deposited in cases of abnormous ossification.

The philosophical method of management would seem to be, to produce a thorough revolution in the whole system of nutrition, by changing the diet, and recommending the individual to seek an entire mutation of all the atmospheric and other influences surrounding him. Mercurials and other substances belonging to the class of eutrophics, —iodine, and its various preparations, for example,—may be serviceable in this view; and we can readily understand how new impressions, made on the nerves by the various remedies recommended for hysteria, may put an end to the adipous secretion by removing the irregularity of the nervous and other functions which constitute that protean disease.

VI. CHOLERA.

Under this head, we shall consider, *first*, the ordinary Cholera Morbus of this country; *secondly*, the Asiatic Cholera; and, *thirdly*, the Cholera Infantum.

a. *Cholera Morbus.*

Synon. Sporadic Cholera Morbus, Cholera nostras, Cholerrhagia, Passio Felliflua, Passio Cholerica, Morbus Fellifluus; *Fr.* Cholera, Cholera Morbus Sporadique, Ch. Européen; *Ger.* Gallenruhr, Brechruhr, Brechdurchfall, Gewöhnliche sporadische Cholera.

This disease has been known from early antiquity, and was originally, as the name imports, (χολη, "bile," whence χολερα,) supposed to be owing to an overflow of bile, which was discharged upwards and downwards.

Diagnosis.—In the generality of cases, perhaps, before the unequivocal symptoms of cholera morbus declare themselves, there is more or less evidence of general, or of gastro-intestinal disorder;—sometimes shivering, headache, pain in the abdomen, nausea, &c.: but, at other times, the disease appears without any premonitions,—violent vomiting and purging occurring almost simultaneously. In the first instance, the ejected matters are the contents of the stomach, mixed with a considerable quantity of the secretion from the mucous membrane; but, when the efforts continue, and the duodenum participates, the liver is called upon, by the excitation, for an increase in its secretion; the secreted bile passes through the pylorus into the stomach, and is observed in the ejected matters. This is the simplest and mildest form of cholera morbus. In the more severe forms of the disease, considerable pain is experienced in the abdomen, and especially in the epigastrium; and violent cramps are felt in the muscles of the limbs. In cases, that are induced by improper articles of diet, there may be more or less frequency of pulse, and heat of skin, with great thirst; but when the vomiting and purging, and muscular contractions are severe, the surface is pale; the features are pinched; the eyes hollow: and the skin is covered with a cold, clammy perspiration. The anxiety

is great, and the depression alarming. In the great revolution of functions, produced during the violence of the disease, the urine is commonly suppressed, but if any be discharged, it is usually of a dark colour, has a feeble acid reaction, and its specific gravity is below the average; in one case observed by Simon, it was 1011·0; and in another by Heller, 1018.

The disease does not generally last for any great length of time in temperate climates. An attack frequently comes on during the night, which passes off, and leaves the patient well, or nearly so, on the following day.

Causes.—Cholera morbus, like diarrhœa, is a disease of warm climates and seasons. With us, it occurs in summer, and more frequently, perhaps, in early autumn, after the system has been subjected to elevated summer heat. The most common exciting cause is diet, improper by quantity or by quality. Particular articles induce it more frequently than others,—nuts and cucumbers for example. Ice and ices are reckoned by Andral among the exciting causes; but, in this climate, they cannot be so regarded. The free use of ice-water is, indeed, well adapted to prevent any form of erethism of the mucous membrane of the digestive tube.

Pathological Characters.—Pathological anatomy has thrown no light on the essential nature of cholera morbus. Where the patient has died speedily, the most careful examination has exhibited no change of appearance; but, when the disease has continued for some time, red, brown, black, and even gangrenous, patches have been observed in some part of the canal. The liver, too, has been found tumefied and gorged with blood. None of these appearances, can, however, fix the seat of the disease, for the patches alluded to are sometimes met with in the stomach; at others, in the duodenum; and, at others, again in the lower portion of the intestinal canal. Not many opportunities occur for examining the pathological appearances in common cholera morbus, as it is a disease which rarely proves fatal. M. Grisolle concludes, that by analyzing its chief symptoms, we are led to infer, that it is an active flux effected at the gastro-intestinal surface according to a mechanism yet unknown; but this throws no light on its pathology.

Treatment.—In a common case of cholera morbus, opiates are the best remedies. They may be given in soda water, or in the ordinary draught made of the soda powders. These last may also be given with advantage without the opiate. A full dose of opium, or of its preparations, is advisable.[a] This may be repeated in the course of an hour, or even earlier, should there be signs of its having been returned by vomiting. When there is much epigastric pain, or cramp of the extremities, opiates are still more demanded. Instantaneous relief sometimes follows the administration of fifty or sixty drops of the tincture of opium. Hot fomentations may, at the same time, be made to the epigastrium and to the parts affected with spasm; or sinapisms may be used with the same view; or frictions with stimulating liniments.[b]

[a] R.—Tinct. opii gtt. xl.—lx.
Aquæ cinnam. f3j.
Syrup f3j.—M.

[b] R.—Liq. ammon. f3ss.
Ol. olivæ f3iss.—M.
Or, R.—Linim. camphor. f3iss.
Tinct. cantharid. f3ss.—M.

Ipecacuanha, as an emetic, has been believed, by some, to mitigate the violence of the disease, whilst others deprecate all emetics. It is not easy to see in what circumstances they can be useful.

The diet and drinks must be those recommended under Chronic Diarrhœa.

b. *Cholera Asiatica.*

Synon. Asiatic, Malignant, Indian, Epidemic, Pestilential, Eastern, or Oriental Cholera; Cholera Orientalis, Ch. Indica, Ch. Epidemica, Ganglionitis Peripherica et Medullaris, Trisplanchnia, Trisplanchnitis, Morbus Oryzeus, Cholerrhœa Lymphatica, Cholero-typhus, Psorenteria, Typhoid Fever of India; *Fr.* Choléra épidémique, Mort de Chien; *Ger.* Asiatische, indische, epidemische, morgenlandische, orientalische oder spasmodische Brechruhr, Brechruhrtyphus.

Cholera—epidemic cholera—is said to have been known in India from the earliest ages; but it is of the epidemics of modern times alone that we have accurate accounts. Partial epidemics have been seen in Hindusthan, from time to time, ever since it became known to the British. In Upper Hindusthan it destroyed, in 1764, 30,000 natives and 800 Europeans. The disease has long been endemic there; and it is a curious, but, in the existing state of our knowledge, an insolvable problem, to determine the causes which induced it to leave India, and to visit Europe.

On the 19th of August, 1817, it broke out with a new and more excursive character at Jessore, in the Delta of the Ganges, about one hundred miles northeast of Calcutta. It was now noticed to follow the rivers, and in September, 1817, it reached Calcutta, where it raged during nearly the whole of 1818. It then extended over the whole province of Bengal, and beyond it, attacking the grand army stationed at Bundlecund, a portion of the Allahabad province. During the year 1818, it ascended the Ganges and the Juhmna, and reached the northern provinces of Hindusthan, but was there checked for several years by the Nepaulese mountains, and ultimately entirely arrested by the Himālās. It passed, likewise, southward along the coast until it reached Madras. Here, at the onset, twenty medical men were attacked, of whom thirteen died. In December, 1818, it had reached the most northern town of Ceylon. In 1819, Sadras, Pondicherry, and the whole Carnatic were affected. In Bombay, it first showed itself in August, 1820, and in that presidency carried off 150,000 persons. From Ceylon, the disease passed to the Isle of France, where it arrived in October, 1819. Thence it passed to the Isle of Bourbon, and, in 1820, to the eastern coast of Africa at Zanguebar. It never reached the Cape of Good Hope, owing, according to some, to the strictness of the quarantine. It visited Malacca in 1818; the Burmese empire generally, Aracan and Ava, in 1819; Sumatra in 1819; Java in 1821; and the Moluccas in 1823; Borneo and Celebes in 1820, and broke out with great violence at Manilla. In 1819, it appeared in Siam, Bankok, Tonkin, Cochin China, and was very

fatal in Cambodia. In 1820, it reached Macao; thence it passed to Canton, and reached Pekin in 1821.

These facts show, that the common notion of the disease always travelling from east to west is erroneous; and its farther progress exhibits, that even when it proceeded westward from Hindusthan, its direction was not always from southeast to north-northwest as has been asserted.

In 1821, the disease spread to Muscat, Bender-abassi and Bassorah; and in the last city it destroyed 50,000 persons; from these places it passed along the rivers, and generally along the commercial routes. From Bassorah, it proceeded up the Euphrates and Tigris, and reached Bagdad in 1821. Proceeding along the Euphrates it reached the ruins of Babylon. and passed across the desert to Aleppo. Thence it extended to different towns in Asia Minor. From Benderabassi, in Persia, it travelled along the great mercantile road to Shiras in 1821. The various provinces of the Caspian were soon affected. Here it ceased for a time, and reappeared in the middle of 1823, and travelling along the Persian seaports of the Caspian, it reached the river Cur, which it ascended, and in September, 1823, reached Astrachan. In June, 1823, it appeared in the vicinity of Laodicea and Antioch, and spread in two directions along the coast of the Mediterranean. At this period, it ceased its ravages in the west; but continued in India, and extended from Asia Minor, Persia and China, through Tartary and Chinese Tartary. In 1829, it suddenly broke out at Orenburg in Russia with intense violence; and Astrachan became again attacked, with much greater fatality than in 1823, (mortality 8,000.) From Astrachan it ascended the Wolga, and in 1830, reached Saratow, Kasan, Nischnei Nivogrood, Kostroma, Jarislaw, &c. From the Caspian and Black Sea it spread through the Caucasus to the Don, which it ascended; and coasted along the Black Sea to Cherson and Odessa, which it reached in autumn, 1830. In September 1830, it attacked Moscow, and did not cease until the end of the following March. In the autumn of 1831, however, more than 1000 cases occurred in that city. During the winter and spring of 1830–31, it spread far to the west and south, and through the river provinces of the Dnieper, the Bug and the Dniester. In 1831, it reached St. Petersburg, and, in the same year, visited Warsaw, Archangel, Helsingfor, Abo, Aland, Danzig, Elbing, Thorn, Konitz, Memel, Königsburg, Stettin, Berlin, Frankfort on the Oder, and Magdeburg. From Magdeburg, it spreads extensively upwards along the Elbe to Hamburg, which it reached in October, 1831. It is curious, however, that Leipzig, Dresden, Hanover, with the exception of Lüneberg, Sachsen-Weimar, Gotha, Anhalt, Hessia, Brunswick, and other small principalities, escaped. Austria suffered very severely—number of deaths, 97,770. In the same year, it visited Pesth and Presburg; proving fatal in Hungary to 240,000 persons. Vienna and Prague were both afflicted in the autumn of 1831, Moldavia in the spring; and, in the autumn, Egypt was visited for the first time. On the 26th of October, 1831, it was first seen at Sunderland, England; in January, 1832, it was in Edinburgh, and on the 10th of February, in London; but its ravages were comparatively small. Indeed, it has been estimated, that the whole of the victims from the

disease in Great Britain and Ireland, did not amount to more than 30,000. It is not the author's intention to trace its course to every town in the Islands. This has been well done by Professor Graves, of Dublin, in a communication which is accessible to all. (*Dublin Journal of Medical Science,* Jan. 1840, reprinted in the author's *American Medical Library,* vol. iii., 1840.) It is singular, however, that it left a number of places entirely untouched, and others were but slightly affected.

Cholera first appeared in Paris in March, 1832, and with great rapidity, various parts of France were attacked. From England the disease soon passed to Ireland, and appeared in Dublin in March, 1832. On the 8th of June, 1832, it was first seen on this side of the Atlantic in Quebec; and on the 10th it appeared at Montreal. On the 21st of June, it suddenly and unexpectedly appeared in New York, all the intermediate cities on the seaboard of the provinces of New Brunswick and Nova Scotia, and of the states of Maine, Massachusetts, and Rhode Island, remaining wholly exempt. On Thursday, July 5, the first decided case manifested itself in Philadelphia. This city suffered much less than Montreal, Quebec, and New York. The disease spread in various directions, visiting Albany, Troy, New Brunswick, and Rochester, in July; Baltimore, Washington, and Boston, in August. During the same months, it was prevalent in several parts of New Jersey and Delaware. About the 1st of October, it suddenly broke out at Cincinnati, and nearly simultaneously at Madison, Louisville, and St. Louis; and by the latter end of the month, it reached New Orleans. Leaving the Ohio, it visited Tennessee, Illinois, Indiana and Kentucky,—Lexington, Maysville, and some other towns, suffering severely. During the same year, the disease visited Campeche, where it was exceedingly fatal,—4000, out of a population of 20,000, falling victims to it. It also visited the Havana early in 1833, but never reached any other West India island; nor did it extend to Guiana, Demerara, or any of the embouchures of the great South American rivers Amazon, Orinoco, or La Plata. In 1834, it revisited many of the cities of this country, which had previously suffered, and spread to others that had been left untouched; yet singular cases of entire immunity were met with. Two of these may be mentioned as examples. Fredericksburg on the Rappahannock, and on the great road from Washington to the south, may be said to have escaped almost wholly; and whilst the disease was prevailing at Richmond, and the inhabitants of Charlottesville, and of the University of Virginia in its vicinity, were daily expecting a visitation, not a case occurred, although travellers daily arrived from the afflicted city in the public stage. Philadelphia and Baltimore both suffered again, but not severely, in 1834. Charleston also was visited, with most of the southern towns. The disease recurred, indeed, at intervals, for a year or two, but ultimately disappeared, not to return, unless the same endemico-epidemic influences should exist, which favoured its progression previously. In like manner it occurred at Marseilles and Toulon in 1835; at Naples in 1836; and at Bona in 1837. Marseilles was attacked, for the third time, in the same year, and it reappeared in the

autumn at Berlin, Prague, and Danzig. The number of persons attacked in the Lombardo-Venetian states, in 1836, was estimated at 100,000, of whom 55,000 died. In the latter part of 1837, the inhabitants of the British metropolis were alarmed by the appearance of cases of Limehouse, which were pronounced by some to be genuine Asiatic cholera; but, by others, to be emanations from "alarmist cholera-hunters." The disease, if it existed, never certainly became epidemic.

Diagnosis.—In almost all the epidemic visitations of cholera, certain precursory or premonitory symptoms have been observed; some of which, on other occasions, might have been suffered to pass unheeded; but, in consequence of the prevalent alarm, were the source of much anxiety. The alarm, indeed, in some instances, was so great, as to constitute a real *choleraphobia* or *choleramania;* the patient being, for the time, in a state of hypochondriacal monomania; at times, believing himself to be afflicted with a disease which had no existence except in his imagination, and at others magnifying symptoms into inordinate importance. This very anxiety and the perpetual direction of the attention towards the intestinal canal may have induced more or less derangement of function, and certainly added to the tortures of the individual.

The premonitory symptoms, consisting of more or less derangement of the digestive functions, with diarrhœa to a greater or less amount, were generally termed *cholerine.* The appellation has, indeed, been applied both to the premonitions, and to what may be regarded as the first stage of cholera.

At times, great and inexplicable debility is experienced, as if the patient had suffered great loss of blood; vision is impaired, along with giddiness and tinnitus aurium; there is also much thirst, with tumefaction of the abdomen and want of appetite. These symptoms may or may not precede the essential phenomena, which are vomiting and purging; the latter sometimes preceding, for a time, the former. The evacuations are extremely frequent, and, in the first instance, may not exhibit any thing unusual, but soon they are copious, liquid, almost without smell, and resemble in appearance rice-water; hence, they are commonly termed *rice-water evacuations.* As these evacuations go on, the patient becomes extremely restless and indisposed; violent cramps attack the extremities, and even the muscles of the chest and abdomen: those constituting the calves of the legs are, however, most commonly affected, and, next to them, perhaps, the muscles of the fingers and toes. In the mean time, the forces that move the blood are rapidly impaired; the pulse sinks; the extremities first, and, afterwards, the face, and whole body become cold; the features are now astonishingly changed, so much so, that they are scarcely recognisable; the author has, indeed, been unable to recognise the familiar features of an acquaintance a very short time after the onset of the disease; the eyeballs are drawn, as it were, into the very bottoms of the orbits; the patient is excessively restless, and the thirst almost unquenchable. The powers of circulation and calorification become more and more impaired; even the breath feels cold; and the thermo-

meter, placed under the tongue, indicates that the animal heat has fallen many degrees. The patient is now in a state of collapse; the surface is blue, or he is *cyanosed*, if we may employ a French term. He is in the *blue stage* of the disease, or in *cholera asphyxia*. The surface of the hands are wrinkled, as if the fluid had been withdrawn from them, and so shrunken, that rings fall from the fingers and shoes from the feet; the features become pinched, owing to the same cause, and the expression is quite characteristic. The cold expired air has been analyzed, and proved to have undergone little or no change from respiration. Little or no hæmatosis could, consequently, have been effected. The nose is cold, and is said to have become gangrenous in some cases; the urine is wholly suppressed; the voice husky; the powers of life gradually fail; the pulse is no longer perceptible; the breath becomes slower and slower; and hiccough frequently precedes the fatal termination,—the senses remaining unimpaired until almost the last; and, in some cases, the patient raises himself from his bed, under the influence of the cramps, or when called upon by the desire to vomit or to discharge the fæces, until within a short time of his death.

This is the course of the disease in fatal cases, which, in every epidemic, have been numerous, and, what is singular, the average mortality has been everywhere pretty nearly in the same ratio. In more fortunate cases the blueness disappears; the pulse becomes perceptible, the heat returns, and general reaction is evidenced by febrile signs, and, at times, great headache; the secretion of urine, which had been arrested during the preceding stage, is restored; the vomitings diminish in frequency, and the alvine evacuations also; the face resumes its wonted expression, and all the symptoms gradually disappear. Too frequently, however, matters do not progress so favourably. Signs of cerebral hyperæmia often supervene; intense headache, delirium, stupor, subsultus tendinum, &c.; at other times, the irregularity of circulation, during the period of reaction, attacks other internal organs—as the air passages. The whole system of nutrition, in other cases, becomes implicated, and signs of the typhoid condition, or exanthematous eruptions, appear on various parts of the body. It has been a question whether any of the symptoms, enumerated above, can be regarded as diagnostic of Asiatic cholera. The most characteristic, according to general belief, are the rice-water discharges. These have been frequently analyzed. When examined, two hours before death, by MM. Gérardin and Gaimard, they had the appearance of whey, the specific gravity being 1·0073, with a strongly alkaline reaction. Heat rendered the fluid opaque, and corrosive sublimate very turbid. It consequently, contained albumen. The alvine evacuations possessed the elements of which the blood was deficient,—serum, alkali and other salts. The vomited matters were also examined. Their character would seem to have differed,—according to some, being alkaline; according to others, acid. Along with this character of the matters evacuated,—the disturbance of the respiratory and circulatory functions, the icy coldness, the cramps, and the peculiar change of features, give to Asiatic cholera a character which cannot readily be mistaken.

In regard to the character of the urine, we are not possessed of any definite information.

The sensation communicated to the hand on touching a person in the blue stage of cholera is similar to that experienced on touching the nose of a dog, or a cold-blooded animal; yet the real temperature has not been found, by positive observation, to be so much depressed as this circumstance would induce one to believe. This is confirmed by the following table, the results of the labours of a distinguished physiologist, M. Magendie.

Subjects.	Pulsations of heart per minute.	Respiratory movements.	Temperature, (Fahr.)	
			Hands.	Mouth.
Child 3 years old,	20 to 25 No pulse.	22	77	86
Youth 15 years old,	20 — do.	12	77	86
Man, of 66,	12 to 15 do.	32	70	86
Woman of 36,	None. Pulsations at the ear.	30 to 36	68	77
Girl, of 13,	None. No pulse.	11	72	84
Man, of 49,	15 do.	12	74	88
Woman, of 60,	20 do.	15	68	83
Man, of 55,	70	32	70	74
Man, of 70,		42	70	70
Woman, of 47,	79	34	72	83

Professor Czermak, of Vienna, found the maximum of refrigeration in the feet, next in the hands and tongue, face, neck, and scrobiculus cordis; and MM. Gérardin and Gaimard, in their experiments, found the temperature of the tip of the nose lower even than that of the feet, whilst the region of the heart and the axilla always exhibited the greatest degree of heat. It does not appear that recovery took place when the temperature fell below 67°.

The changes, that occur in the blood, are remarkable, and this in proportion to the intensity and duration of the collapse. It becomes dark, and so thick as to bear a strong resemblance to treacle or tar. M. Dieffenbach, of Berlin, opened the brachial artery without blood flowing. The following were the proportions of the clot to the serum —as the disease advanced—observed by MM. Gérardin and Gaimard.

Clot—	50	55	60	60·3	62·5
Serum—	50	45	40	39·7	37·5
	100	100	100	100·0	100·0

The blood of a patient, who had recovered from cholera, and was afterwards attacked with fever, had the following proportions: Clot, 46·25; serum, 53·75. The ratio of albumen to the serum increased with the intensity of the disease, and attained its maximum a short time before death. If the specific gravity of healthy serum be estimated at 1·027, it will be found, that, after the rice-water evacuations occur, it will rise to 1·028, afterwards to 1·032, and in one case it was found to be 1·036, four hours before dissolution. In other cases, it has been observed to vary from 1·040 to 1·045; and, at times, according to M. Lecanu, the solid matter is double what it is in health. Urea has also been found in it by Messrs. Rainy, O'Shaughnessy, Marchand, and Simon.

The result of the analysis of various observers shows, that cholera blood contains less water than healthy blood, and that its salts are in very small quantity, or almost entirely wanting. Owing to this absence of saline matter, the clot is not reddened by the contact of oxygen.

After the prevalence of cholera, Dr. Prout observed an absence of the common lateritious sediments in the urine; and about the time the disease first made its appearance in England, the same observer noticed a positive increase in the weight of atmospheric air, similar to what might be supposed to be produced by the diffusion of a heavy gaseous principle through the lower regions of the atmosphere. Hence he concluded, that the cause of cholera and of the urinary peculiarity was a poisonous body analogous to malaria, whose high specific gravity and feeble diffusive powers kept it near the earth's surface, along which it insensibly crept, especially in low and damp situations. He very properly, however, does not lay much stress upon this conclusion. During the prevalence of the above mentioned state of the urine he likewise noticed, in almost every individual, an unusually acid state of the saliva, and of the cutaneous exhalations; and about the time the cholera prevailed, and a little afterwards, he saw more cases of oxalate of lime renal calculi, and of formidable hemorrhage from the kidneys, &c., than he had ever previously seen during the whole of the long period that urinary diseases had occupied his attention. As the cholera disappeared the above state of matters gradually subsided.

Causes.—Of the primary or efficient cause of cholera, we know no more than we do of that of smallpox or measles, or, indeed, of any of the diseases, which are owing to endemic or epidemic influence. It is, therefore, unnecessary to do more than allude to the various speculations as to its sidereal, animalcular, cryptogamic, or other origin, which have been adduced from time to time. The analysis of the air has been unsatisfactory. Nothing has been discovered, except the ordinary physical constituents of the atmosphere. And what shall we say of the supposition of certain physicians of India, that the disease was owing to damaged rice, of the harvest of 1817, especially in the territory of Oude—whence the name *Morbus oryzeus* or "Rice disease," applied to it by Tytler? Whatever notion of the kind may have, at one time, existed, it must soon have been dispelled, when the disease continued beyond the year 1817, and extended to countries whose inhabitants eat no rice, as well as to others by whom rice was found to be the best prophylactic aliment.

The primary cause of cholera being unknown, we may pass to the next question. Does it travel by contagion, or is its epidemic visitation owing to general influences, which act, for the time being, on every one in the same locality, so that the disease may occur independently of all communication with infected persons? The advocates of contagion must admit, that in few respects does it resemble many of the diseases that are unquestionably communicable. It cannot be conveyed by inoculation; nor does it appear to have spread in the same manner as we should expect contagious diseases to do. In many instances, it has declared itself for the first time in various parts of the

same locality, where communication between the sick appeared almost impracticable. Such was the case with the epidemic at Baltimore, in 1834, which the author had an opportunity of witnessing; and examples of its passing over places, which were keeping up daily and uninterrupted communication with infected districts, and affecting more remote places, are almost innumerable. In some cases, where rigid quarantine was observed, the cholera did not break out; but this may have been a coincidence; as, in other cases, the disease declared itself under such circumstances in spite of every precaution. Facts, similar to the following, have occurred in all countries visited by it. At Astrachan, it broke out, notwithstanding all sanitary regulations. A few days afterwards, all such regulations were abolished, yet the disease ceased spontaneously in a few weeks. Whilst it was raging at Astrachan, many families left the city, and dwelt in the neighbouring villages; yet, although a constant communication was kept up with the city, they remained unaffected. After having left Astrachan, it did not return, although vessels were constantly arriving from Saratoff, whilst the disease was raging in this last city. These vessels took not only merchandise to Astrachan, but persons labouring under cholera, several of whom died. Still, the disease did not recur there.

In their zeal for the doctrine of non-contagion, some have gone so far as to assert, that in no case have those, who had the most communication with the sick, been attacked in greater proportion by the epidemic. This is not strictly the fact, nor ought we to expect it to be so. In Moscow, according to Jahnichen, there sickened between thirty and forty per cent. of the persons who had hospital duty to perform, including physicians, nurses, &c., whilst, of the whole population, not more than three per cent. took the disease. In Dublin, too, great numbers of the hospital attendants were affected, and many died. Yet these cases may be explained by the circumstance, that they were all exposed to the same epidemic influence, and were under favourable circumstances, owing to fatigue, want of sleep, &c., for the production of the disease. On the other hand, Dr. Eberle affirms, that in the cholera hospital at Cincinnati, in which, during a period of nearly five weeks, there were constantly from fifteen to twenty cholera patients, *not a single case* of the disease occurred among the physicians, nurses, and other attendants, although some of these remained in the wards day and night during the whole period, and frequently slept on beds where cholera patients had lain and died. It was a common observation, indeed, in this country, that the physicians and the nurses, although under what might be regarded predisposing influences—even admitting the disease to be epidemic, and not contagious —suffered comparatively little.

One more circumstance may be mentioned—the manifest influence pervading all the inhabitants of a locality, and exhibiting itself not only by premonitions (*cholerine*), before the true cholera made its appearance, but likewise when it was present. This is certainly rather in favour of an action of an endemico-epidemic character. There are, however, many inexplicable circumstances in the whole geographical and topographical history of the cholera:—the fact of its generally

following the great routes of commerce, and the assertion, that it never traversed the ocean at a rate exceeding that of ships, are points that would incline to the belief of contagion; yet this cannot be considered established. Indeed, a careful consideration of all the phenomena leads to at least a doubt, whether its progression—geographically, or from individual to individual—have ever taken place in that manner.

Whether the disease be propagated by contagion or by epidemic agency, there are many circumstances, which exert considerable influence on its development. Most commonly it was observed, that the indigent part of the community was more frequently and fatally attacked than those better off in the world. Accordingly, it prevailed most in the crowded, filthy, and worst ventilated portions of cities; in which, it was presumable, little attention was paid to diet, and but little care taken during the premonitions; yet, on the other hand, in 1834, the epidemic appeared to attack more the better classes of persons. In 1832, few of these died; in 1834, several. Again, it was noticed, that, at Montfaucon, near Paris, where the knacker's operations are carried on, and where the air is filled with putrid odours, the ravages of cholera were less than elsewhere; and it is probable, that, if the workmen had been removed to a purer air, they would have suffered. During the alarm of cholera, the diet was frequently changed; and as they, who habitually indulged in the use of spirituous liquors, were presumed—as in the case of other epidemics—to fall victims more readily to the malady, the accustomed stimulus was often suddenly abandoned. This could not fail to exert a prejudicial effect; and, accordingly, it was generally held as the most salutary rule, that every material change in the habits might contribute to the production of the disease. Errors of diet were doubtless exciting causes; yet, after all, universal experience did not settle down upon any which were especially objectionable. The employment of irritating cathartics was, also, a cause, where the predisposition was strong.

At one period it was presumed, that the approach of winter would entirely arrest its progress, but brief experience showed, that it might rage with virulence through that season. On the 20th of September, 1830, it appeared in Moscow, and did not cease until the end of the following March. A severe frost and snow set in towards the end of November, without in the least diminishing the spread or the intensity of the disease. At St. Petersburg, too, it exerted its ravages in the midst of winter. Perhaps, however, the summer season has generally witnessed its greatest severity.

Intense moral emotions and excesses, and debility of every kind have acted as exciting causes.

During the existence of the cholera atmosphere in France, various animals, according to Messrs. Carère and Mitivié, and Clement Desormes, were affected with epizooties; and the horses and cows in Edinburgh, in 1833, were attacked with symptoms of cholera.

Pathological Characters.—It has been remarked, that of those who died in the completely algid period, and in which there was coldness of the whole body, some became warmer after death, and preserved a

manifest degree of heat until the commencement of rigidity. This the author never witnessed; nor has he noticed the muscular tremors, and spontaneous movements so generally described. The blue tint diminishes in intensity after death, and is often limited to the extremities, frequently to the pulps of the fingers. It has been affirmed, too, that the body exhales an odour *sui generis*. On examining the digestive tube, the stomach and intestines are found deeply injected; vessels being seen clearly defined, which in ordinary injections are not perceptible. The intestines, when opened, contain the same kind of rice-water secretion, as is discharged by the bowels. Not uncommonly, signs of acute or chronic inflammation are met with, but in numerous instances no such appearances are perceptible. The intestinal follicles are frequently developed; but the appearance is not always the same. At times, there is an eruption of small, miliary, white semi-transparent vesicles, which are distributed over the whole of the mucous membrane of the small intestine. Venous injection and follicular eruption, M. Andral considers to be the only alterations of the digestive tube, which, in all other respects, preserves its normal characters. The small intestines especially have often been found lined with coagulable lymph, the membranous nature of which Dr. Horner, of Philadelphia, proved, by maceration in alcohol, and by the process of drying. By some, this has been considered to be a layer of mucus.

Examination of the blood of a choleric patient by M. Andral showed, that there was no augmentation of the fibrinous element as is found in severe phlegmasiæ of the digestive tube. The proportion of fibrin was 3·3; of globules, 118; and of solid matter of the serum, 88.

The German and French physicians have paid considerable attention to the eruption of isolated, granular pimples chiefly met with in the two lower thirds of the ileum, but seen, also, in different parts of the duodenum, jejunum and colon, and, at times, occupying the whole extent of the mucous membrane of the intestinal canal. The size of these pimples varied from that of a grain of millet to that of a grain of hemp; and, at times, they were solid and papular; but, at others, contained a serous or milky fluid. This eruption is said by MM. Serres and A. Nonat, to exist in the vast majority of cases; and, accordingly, the disease has received the name *psorenteria* from these gentlemen. When death had occurred in eight or ten hours, the granulations were scarcely perceptible, and at times could not be detected. When the disease continued from twenty-four to twenty-eight hours, the eruption had attained its full development. If life were prolonged beyond two days, the eruption gradually diminished; and, by the sixth or eighth day, it was usually completely effaced. The lungs generally did not fill more than half the cavity of the chest; were perfectly healthy in appearance, and contained but little blood,—their capillaries being almost empty. Reddish granulations were several times found on the mucous membrane of the trachea.

On the external surface of the heart, brown spots were often observed, owing to infiltration of blood in the sub-serous cellular tissue. The left cavities were almost entirely empty, whilst those of the right side were gorged with dark, thick, and viscid blood, resembling cur-

rant-jelly too much boiled, or thickened elderberry juice. The parietes of the heart were noticed to be less firm than usual. In the aorta, there was more or less blood; sometimes extremely little; whilst the pulmonary artery and the venæ cavæ were gorged. The arteries of the limbs were commonly empty, and had here and there coagula of blood, and the whole of the venous system contained a vast quantity of thick blood, of a syrupy consistence, similar to that which it contained during life, the characters of which have been described before. It may be added, that under the microscope, the blood globules appeared unequal and lacerated, and had lost their regular shape. The spleen was sometimes much less than common; but at others, greatly enlarged, and distended with blood. The other organs exhibited nothing of importance.

It will be obvious, from this detail of necroscopic appearances, that they throw but little light on the nature of the disease—great accumulation of blood in the veins, and the appearances met with in the lining membrane of the small intestines, being the most constant pathological conditions.

Various speculations have been entered into as to the nature of cholera. The majority, perhaps, have placed it in the organic nervous system; and it was affirmed by MM. Delpech and Coste, that the semilunar ganglions were observed to be red, injected, and softened; but subsequent observation did not confirm this. Some have regarded it to be a diseased condition of the blood itself; others, a miasmatic disease; others, a pernicious algid fever; others, a gastro-enteritis; and others, again—as we have seen—have considered it an eruptive disease of the mucous membrane of the intestines—an endo-enteritis of a peculiar character. It would certainly seem, that, probably through the nerves distributed to the intestinal blood-vessels, an excited state of the vessels of the mucous membrane is induced, owing to which the watery portions of the blood are exhaled, until ultimately it becomes too thick to circulate in the intermediate or capillary vessels; hence the whole circulatory system has its functions impaired, and ultimately annihilated. The collapse, consequently, would seem to be owing mainly to the changes effected on the fluid of the circulation by a local irritation in a part of the system, where nutritive absorption is largely effected in health, but wholly suspended in disease, —some of the chief constituents of the blood being at the same time copiously exhaled from the vessels. Such is the case, at least, with the great mass of cholera patients; but, occasionally, the deadly impression appears to affect the nervous system so deeply and suddenly, that the functions cease almost at once, and the patient passes into a state of collapse without discharges either from the stomach or bowels.

It is pretty clear, that, in every case of cholera, the function of innervation must first be morbidly impressed; but, according to the extent of such impression, the capillaries of the intestine may either be capable of inordinate secretory irritation, in the manner suggested above, or their functions may be rapidly and totally annihilated.

Notwithstanding the similarity, in many respects, between cholera

morbus and epidemic cholera, in these climes, it is evident, that they are essentially different; and it is probable that, prior to the period we have mentioned,—that is, before the first quarter of the present century,—spasmodic or epidemic cholera was totally unknown in Europe. They, who consider epidemic cholera to be a *psorenteria*, make a wide distinction between the two;—sporadic cholera morbus being, according to them, a greater or less degree of irritation of the stomach and intestines, and epidemic cholera approximating the eruptive diseases, and especially dothinenteria. It has been a common remark, however, that since the recent epidemics of cholera, many of the sporadic cases of cholera morbus have received the impress of certain of the characteristics of the former.

The epidemic of Naples was complicated by a verminous constitution of the most singular kind that has ever been recorded. This verminous epidemic was not, however, confined to those who died of cholera, or who were affected with symptoms of it, but occurred in all the inhabitants of the country; and it is asserted, that the most constant morbid appearances observed in cholera, such as injection of the digestive mucous membrane, development of the mucous follicles, the presence of an unusual kind of mucus, and of trichocephalous worms, with change in the character of the blood, were equally met with in those who died, during the epidemic, of other diseases than cholera.

Statistics.—From some estimates made in England by Sir David Barry, it would appear, that 38·5 per cent. of the cholera patients died. In 1832, probably 5000 perished in London, and in Great Britain somewhat more than 20,000. In Paris, during the epidemic of 1832, more than 18,000 fatal cases are said to have occurred. In the Russian provinces, the mortality was 58·6 per cent. In Naples, it was estimated at 6 to 10. In Palermo, it was dreadful. Of a population of 150,000, about 30,000 of whom, it was supposed, left the town at the breaking out of the complaint, 25,000 died, or about a fifth part of those who remained. In some of the towns of this country, the mortality was taken as accurately as was practicable. It is thus stated by Professor Jackson, of Philadelphia.

Places.	Population.	Cases.	Deaths.	Ratio of cases to population	Ratio of deaths to cases.	Ratio of deaths to population.
Quebec,	32,000	5783	3292	1 in 5+	1 in 2·5	1 in 10 5
Montreal,	28,000	4385	1853	1 in 6·5	1 in 2·5	1 in 15+
New York,	240,000	5547	2782	1 in 25·3	1 in 2	1 in 15·5
Philadelphia,	160,000	2314	935	1 in 70	1 in 2·5	1 in 173·2

From the epidemic at Paris, attempts have been made to calculate the probability of death and recovery in Asiatic cholera. From these it would appear, that the daily rate of mortality, in the first 12 hours, was 16 per cent.; in the next 12 hours, (12–24,) 37 per cent.; in the 2d day, 11 per cent.; in the 3d day, 8 per cent. The mortality of cases of cholera, in Paris, was 49 per cent. The force of mortality attained its maximum in cholera by the 21st hour, (18–24 hours;) the

maximum intensity of smallpox being attained in 10–15 days; of phthisis, in 6–9 months. The danger of cholera decreases as the time advances: the longer a cholera patient lives, the more likely is he to continue to live. Half the deaths happen in 24 hours.

The following table by Mr. W. Farr shows the probability of recovery from the severer attacks of cholera at the end of 12 hours, and of 1, 2, and 3 days.

Cases.	To recover.	To die.	Probability of recovery.
0 hours, 10,000	5093	4907	·509 nearly 1 to 1
12 9185	5093	4088	·555 — 1·3 to 1
1 day, 7616	5093	2523	·669 — 2 to 1
2 6793	5093	1700	·750 — 3 to 1
3 6991	5093	1198	·809 — 4 to 1

Treatment.—The facts, mentioned in a preceding paragraph, show the importance of having recourse to early treatment. This has varied greatly, according to the difference of pathological views, and in many cases it has been altogether tentative. The author's observation of the epidemic of 1834,—for, of that of 1832 he had no experience,—led him to prefer one, suggested by the view, that the disease essentially consists in an inflammatory, or phlegmonoid condition, of the mucous membrane of the intestines. The treatment may be divided into,—*first*, that which is proper in the first stage of the disease; *secondly*, that which is demanded in a state of collapse; and *thirdly*, in the period of reaction.

1. On the first appearance of the symptoms of cholera, it is important to send the individual to bed, and to keep up a warm, perspirable state of the surface, by means of ordinary diluent drinks, such as tea or barley water. These simple means, with hot cataplasms to the epigastric region, were sufficient, in many cases, to arrest the disease; but if the evacuations were numerous and liquid, and, especially, if there was heat with pain of the abdomen, it was advisable, in plethoric persons, to bleed from the arm; but generally the joint depletive and revellent action of cups or of leeches was preferable,—the quantity of blood to be taken being judged of by the circumstances of the case.

In the early stage, especially if there be any evidence of the stomach being loaded, emetics have been advised, as chamomile tea, ipecacuanha, (gr. xv.), but more especially mustard.[a] If, too, the evacuations contain solid feculent matter, or are offensive, a gentle dose of castor oil, (f3i.—f3iij.) or a dose of rhubarb and magnesia[b] may be given.

[a] R.—Sodii chlorid. cochlear. larg.
Solve in aquæ ferventis f℥vj.
Adde pulv. semin. sinap., cochlear. larg.
To be taken at once.

[b] R.—Rhei. pulv. gr. x.
Magnes. gr. xv.
Ol. anisi gtt. vj.—M.

A main part of the benefit of emetics results, probably, from their revellent operation; and it has been suggested, whether advantage might not be derived, in these unfortunate cases, from remedies that would even inflame the lining membrane of the stomach; but such a harsh system of revulsion ought scarcely to be thought of. Some, indeed, object strongly to the use of anything that can disorder the stomach and bowels, and Dr. Mackintosh affirms, that he has known many individuals destroyed in the first stage, apparently by taking a laxa-

tive—even a small quantity of calcined magnesia, or an emetic. Saline medicines he conceives to be especially prejudicial. There can be no doubt, indeed, that all such local stimulants should be used with the greatest caution.

Should the disease not readily yield to this system of management, attempts must be made to excite a new action, as soon as possible, in the system, by means of mercurials. With this view, calomel and opium[a] may be given repeatedly, until there is a decided alteration for the better, as indicated by a diminution of the vomiting and diarrhœa.

[a] R.—Hydrarg. chlorid. mit. gr. ij.
Opii pulv. gr. ¼.—M. et f. pil. omni semihorâ sumenda.

It is not, however, easy to affect the system by mercury in this, or, indeed, in any other manner; and when the mercurial action has been excited, it has, perhaps, been owing to the concentration of morbid action having been reduced. The absorbent function is so completely annihilated, or suspended, in the majority of cases, that the mercurials are seen to pass through the bowels unchanged; and they would seem to produce no effect upon the system, until some degree of recuperative energy has been awakened. The same thing is witnessed in long protracted fevers, in which we may, in vain, attempt to affect the system by mercurials. It is a fact, however, that when the new action could be induced, the patients were generally safe. The quantity of calomel that has been exhibited in this disease exceeds belief. It is a favourite remedy with the practitioners of India, whose example led to its employment elsewhere. In the western part of this continent, fifty or one hundred grains were occasionally given every hour, until as much as a quarter of a pound was taken; and one practitioner, Prof. Cook, of Louisville, administered it in two drachm doses in mild cases, and in ounce doses in the more severe, repeating them several times. It is affirmed, indeed, by Professor Eberle, that as much as a *pound and a half* of calomel has been given in a case of cholera! To aid the operation of the internal mercurial, frictions with the unguentum hydrargyri (3i.), were often made, and the ointment was applied to leech-bites, or to wounds made by the scarificator or any other agent.

Opium—like every other remedy, indeed, used in cholera—has met with mixed approbation and reproach. Still, there is no article, perhaps, which has been more employed, alone or in combination, not only in the first stage, but in that of collapse; (*Tinct. opii*, gtt v.—x., given every half hour, until signs of narcosis supervene.) The acetate of morphia has been preferred to all other remedies. Of ninety patients, treated by M. Gérard, of Avignon, with it, eighty-one were cured. He administered it at first in the dose of one-fourth of a grain every half hour, until the serous symptoms were removed, and omitted it as soon as the spasms, and the diarrhœa and vomiting had ceased, or as soon as reaction ensued. Opium may likewise be given in enemata; (*Tinct. opii*, gtt. xl. every hour.) It has been thought, by M. Louis, to be highly serviceable when administered in this manner.

The intense thirst of cholera must be satisfied by a liberal allowance of cold water; nor need the quantity be limited. There can be no doubt that ice and ice drinks are most grateful. Ice frequently allays

the irritability of the stomach, which is a symptom demanding attention, from the distress it occasions. Various agents have been recommended for this purpose; soda water, put up in ounce bottles kept in ice, and administered every now and then; and sulphuric ether alone, (gtt. x.—xx., every half hour,) or united with opium—

R.—Æther. sulphur. f℥ij.
Tinct. opii f℥j.—M.
Dose, eight to ten drops every half hour.

To arrest the diarrhœa, in all stages of the disease, the acetate of lead was much employed in this country, and was brought forward, by Dr. Harlan, with the loftiest pretensions. Since, it has been extolled by Dr. Graves, who used it in much smaller doses than the American practitioners:—

R.—Plumbi acet. ℈j.
Opii gr. j.—Fiat massa, in pilulas xij. dividenda.

He found, that the premonitory diarrhœa was almost invariably stopped by taking one of the pills, at first, every hour; and, as the evacuation became less frequent, every third, or sixth hour, according to circumstances. When the vomiting, spasms, and state of collapse had begun, a pill was given every quarter of an hour. In the author's own practice, as well as in that of others, this agent was by no means attended with such salutary effects as Dr. Graves has described.

Strychnia was employed endermically with advantage, two or three grains being applied to a blistered surface on the nape of the neck. It has also been given internally by Dr. Ryan, to allay vomiting.[a] It is affirmed by him, that a twelfth of a grain of strychnia, given in pill, and repeated a few times,[b] has been repeatedly known to check a profuse diarrhœa, with rice-water evacuations, and even when the extremities were blue, in cholera.

[a] R.—Strychniæ gr. ¼—ss.
Aquæ f℥iij.—M.
Dose, a spoonful every hour.

[b] R.—Strychniæ gr. j.
Micæ panis q. s. ut fiant pil. xij.

When patients recover from this stage, a slight degree of reaction is apt to take place, which requires attention; and relapses must be avoided by attending to the diet, and the state of the stomach and bowels.

2. Even in the period of collapse, it may be advisable to apply cups or leeches to the epigastrium, and to have recourse to the mercurial and other treatment commenced in the first stage. In the algid stage, it is the belief of many that no remedy will arrest the progress of the disease, and that all the physician can do is to diminish the intensity of the phenomena. Still, we repeatedly see cases recover from this state; and, therefore, the efforts should not be suffered to relax.

Many practitioners have restricted themselves, in this stage, to the employment of external stimulants, with the view of restoring the circulation, almost arrested in the vessels of the surface. Friction with the hand frequently dipped in flour, to avoid abrasion of the surface, or with any of the ordinary stimulating liniments,[a] is certainly preferable to the moxa, actual cautery, boiling water, &c., which have been recommended; and the author has seen an occasional case, in

which the patient has recovered in a marvellous manner, under this treatment, as under every other—expectant, or energetic. As the desire may be to administer mercurials at the same time with stimulants to the external surface, they may be associated.[b] The nux vomica has likewise been used as an embrocation.[c]

[a] R.—Lin. camphor. f ʒiss.
Tinct. cantharid. f ʒss.—M.

[b] R.—Ung. hydrarg. ʒj.
Capsici pulv. ʒj.—M.

[c] R.—Tinct. nucis vomic. fʒj.
Liq. ammon. fʒij.—M.

Perhaps external warmth is capable of accomplishing everything that rubefacients can do, and with this view, in the cholera hospitals, tin cases were made, into which hot water or steam was passed.

To relieve the urgent cramps, friction was generally used, and the tourniquet. Relief has likewise been derived from the application of a tight bandage round the extremities.

The extensive loss of serum, and consequently of the watery and saline portions of the blood, led to the administration of solutions of common salt and of the carbonate of soda, internally. Several practitioners of British India recommend them, especially in enemata, administered warm.

R.—Sodii chlorid. ʒj.
Sodæ seu potassæ carbonat. ʒi.
Aquæ (120° Fahrenheit.) Oj.—M.

To be repeated every half hour, hour, or two hours, until reaction is excited, and the pulse rises to a satisfactory degree of health.

Owing, however, to the suspension of absorption from the stomach and bowels, these substances rarely or never get into the blood-vessels, and were, consequently of no advantage. It was then proposed to inject them into the blood-vessels,[a] at a temperature above that of the blood, and the effect upon many of the functions was great and immediate, probably by the excitation; for the perfect conversion of venous into arterial blood demands the action of the nervous system.

[a] R.—Sodii chlorid. ʒss.
Sodæ bicarbon. ʒiv.
Aquæ Ox.—M.

Still, although these injections diluted the blood, and conveyed saline matters into it, they could not remove the important mischief—the pathological cause, that gave occasion to the profuse separation of the watery and saline portions from it. The same remark applies to dilute solutions of albumen, that were injected; and, accordingly, they were but little employed, except by those who were led away by superficial observations and deductions.

Of the guaco, and other *cholera specifics*, no more need be said than that evidence is wanting of their being entitled to any such appellation.

3. Should either the first or the second stage yield, the practitioner must be on the watch for symptoms of reaction. Stimulants, if they have been employed, must be cautiously discontinued. Cupping and leeching may be demanded, if the vomiting of bilious matter be great, and there is reason to believe in the existence of hyperæmia or inflammation of the stomach or duodenum. They may be equally needed, if signs of cerebral disturbance should supervene. Encepha-

litis, or cerebral hyperæmia must, indeed, be treated on the principles laid down elsewhere, bearing in mind the causes that induced them. Revellents—as blisters and sinapisms—will be found of great service in this stage. The practitioner will, indeed, have to meet every case as it arises.

Prophylactic Treatment.—During the existence of cholera, many preventives were brought forward: one, especially, the tincture of camphor, (gtt. v.—viij., three or four times a day,) was extensively used. None of them had probably more than this effect—that they removed, in part, the depression under which the person laboured, by fixing his confidence in the reputed prophylactic; but the evil doubtless resulted occasionally, that he became heedless of other more important prophylactics. These were,—for the person to avoid loading his stomach with those substances, which he knew to disagree with him; to take a due amount of exercise, and to keep the intestinal canal clear. An important matter, also, was not to make too sudden a change in accustomed habits, even if these were of an objectionable character.

To prevent the spread of cholera, under the idea that it was contagious, quarantine regulations and *cordons sanitaires* were established in many places. It is *doubtful*, whether they were of any service, whilst they were *unquestionably* most vexatious. Municipal regulations were also made as to the articles of diet that might be allowed, with safety, during the epidemic constitution; and some of these were of the most whimsical nature—dependent, probably, at times, on individual likes or dislikes, caprices or prejudices. Ripe fruits, and the succulent vegetables, were generally proscribed; yet the facts, that, in eleemosynary institutions, where no such articles were permitted, cholera was most fatal;—that the disease prevailed at Moscow, St. Petersburg, and elsewhere, at seasons when ripe fruits and vegetables could not be procured; and that, in the case of San Martin, (the author's *Human Health*, p. 262,) certain ripe fruits were found most digestible; and, again, the no less interesting fact, that where ripe fruits were freely allowed—as in London, at a later period of the epidemic—no inconvenience was found to result from them, may create great doubts, whether the proscription were founded on accurate observation.

Such are the most important circumstances connected with this extraordinary and formidable disease. Fortunately, it has disappeared from amongst us, and, like the epidemics of the middle ages,—the "black death," for example,—it may hereafter be known in this country only as a matter of medical history. Like all epidemic and contagious diseases, epidemic cholera affords a difficult problem for solution; and we are, perhaps, justified in adopting the following summary of a distinguished pathologist,—M. Andral. "*Anatomical characters*, insufficient; *Causes*, mysterious; *Nature*, hypothetical; *Symptoms*, characteristic; *Diagnosis*, easy; *Treatment*, doubtful."

c. *Cholera Infantum.*

Synon. Cholera of Children, Choleric Fever of Infants.

This disease is one of the most fatal to which children are liable

in the large cities of this country. It has, indeed, been considered peculiar to this climate. It strikingly, however, resembles the affection vulgarly called *watery gripes* in England, and the author can say, from experience, that it is not an uncommon affection in London. It does not appear to be known in Paris. In Philadelphia, according to Dr. Condie, during a period of fifteen years, from 1825 to 1839 inclusive, 3352 infants died of it; being almost 10 per cent. of the whole number of infants under five years of age who died during that period, and 4·5 per cent. of the entire mortality of the city.

Diagnosis.—In many cases it begins with diarrhœa, but, in others, both vomiting and purging come on at first, without any premonitions; or the child may have suffered for a time under gastric or intestinal derangement. The pulse is usually frequent, and somewhat tense, and there are almost always manifest signs of febrile irritation. The discharges are at first extremely fluid, and often frothy; sometimes tinging the cloths green, and, at others, leaving mucus upon them. In very severe cases, the system becomes rapidly prostrated, and the child may die in the course of 24 hours; but, more commonly, the disease continues for a few days before either the tendency to convalescence or to death is manifest. As in the cholera morbus of the adult, there is often severe intestinal pain, which may be increased by pressure, and, at times, the muscles of the abdomen and extremities contract spasmodically. The thirst is excessive, and the appetite gone, or singularly capricious. If the disease be about to terminate unfavourably, emaciation makes frightful progress, the febrile irritation is constant and manifest, the child becomes restless and comatose, and gradually sinks—the fatal termination being at times preceded by convulsions.

Frequently, the evacuations exhibit the existence of great irritability of the canal, the food passing rapidly through, without undergoing any change. At other times, they have a putrid or cadaverous odour. In the more protracted cases, these appearances are more frequently met with, along with aphthæ of the mouth, meteorism of the abdomen, and other signs of follicular inflammation. At times, before death, a vesicular eruption appears extensively on the chest, which Dr. Dewees considered to be invariably a fatal symptom; but Dr. Condie states, that he has in many instances known the patient recover even when this eruption had been most extensive and distinct.

The indication of recovery is the appearance of feculent matter, and of the ordinary secretions in the evacuations.

Causes.—As cholera infantum is a great scourge of our cities during the summer months, not chiefly during the autumnal, as is supposed by many of the European writers, it is obvious, that excessive heat is concerned in its generation; yet, that this is not alone sufficient to induce it is shown by the fact, that in country situations where the heat may be equally great it is comparatively rare. In the nine years, during which the author lived in Virginia, he saw but very few cases. Dr. Eberle states, that during a practice of twelve years in the country, he met with but two or three; and Dr. Condie affirms, that when it does occur in the country, it is almost exclusively in low, damp, and

otherwise unhealthy situations; but such has not been the result of the author's observation. It would seem to be necessary, that there should be a union of atmospheric heat and atmospheric vitiation in order that the disease should exist fatally and extensively; and this combination is met with in the confined and deteriorated air of certain parts of our towns. In the cleanly and well-ventilated districts, and in large and well-aired apartments—as has been properly remarked by Dr. Emerson, of Philadelphia—deaths from it are very rare. At a time in which the bills of mortality indicate the greatest amount of deaths from the summer complaint, those physicians, who practise extensively in the better portions of the cities, may be but little occupied. The following table will show how largely the deaths amongst children, during the summer months, predominate in Philadelphia.

Deaths.	Adults.	Children.
March, April, May, - - - - - - - - -	7,229	5,264
June, July, August, - - - - - - - -	7,606	9,462
September, October, November, - - - - - -	7,545	6,369
December, January, February, - - - - -	6,909	5,153

(See the author's *Human Health*, p. 140, Philad. 1844.)

Age, too, unquestionably offers a predisposition. The common notion in this country is, that children are more liable to the disease in the second summer than the first, but this does not appear to be confirmed by statistical observations. From the official reports of deaths in Philadelphia and New York, it would appear, that in the former city, of 229 deaths assigned to *summer complaint*, 142 occurred in children under one year of age; 75 in those from one to two years; and 12 in those from two to five years. It rarely occurs in infants under three months. In St. Louis, according to Dr. Victor J. Fourgeaud, more than one-third of the mortality of children is reported under the heads of cholera infantum and convulsions.

As the disease is evidently connected with the season at which malarious influences are present, although to a decidedly less degree than in the months when cholera infantum has nearly ceased, it has been supposed by Dr. Rush, and by Dr. Condie, that, like the bilious remittent to which it has been assimilated, it may be caused by malaria. There can be no doubt, that vitiated air has a marked agency in its causation, as has been before observed, but it is not probable that it is produced by the malaria that gives rise to fevers. It certainly is uncommon in districts in which intermittent and remittent fevers are annually and extensively endemic.

Under the predisposition engendered by great atmospheric heat and vitiation, it is clear, that improper aliment may be an exciting cause; hence it is, that children, brought up on spoonmeat, suffer in greater numbers than those that are nourished at the breast; and, in like manner, dentition may contribute to its production.

Pathological Characters.—The mucous membrane of the stomach and bowels generally, and especially the follicles of the latter exhibit evidences of inflammation. Hence, the affection has been recently termed —but not happily—by Dr. Edward Hallowell, of Philadelphia, *Endemic Gastro-follicular Enteritis*. By some, the follicles have been thought the primary seat of the disease. When it has continued for some time,

more or less ulceration is met with, and occasionally considerable portions of the intestinal canal are so much contracted as scarcely to admit a small-sized quill. The *Maladie de Cruveilhier*, previously referred to, has been considered identical with cholera infantum, but although analogous affections, they are not the same. The liver is almost always enlarged. This also has been regarded as the primary affection, but it is more probably secondary. We know, that we can enlarge the livers of animals by exposing them artificially to an elevated temperature, but the probability is that the effect is partly induced by a morbid condition primarily seated in the mucous membrane of the intestines. (The author's *Human Health*, p. 27, Philada., 1844.) The encephalon, in nearly all cases, has been found in a state of hyperæmia; and in long-protracted cases, serous effusions have been met with in the ventricles, and at the surface of that viscus.

Treatment.—The general principles of treatment do not differ from those laid down under Enteritis of the mucous coat, and Diarrhœa. The cases that occur in the airy parts of a town are usually managed with facility, and carried to a happy issue; whilst those that occur in the narrow alleys of the worst parts may resist every effort of the practitioner. The author has generally commenced the treatment by a small dose of calomel (gr. j.—iv.), or by rhubarb and magnesia,[a] and applied a flannel bandage to the abdomen; and, in very mild cases, by sending the child into the open air, in the manner to be described presently, the disease often yields to this simple treatment. If, however, the febrile irritation be considerable, it will be advisable to apply a few leeches to the epigastrium, or, as recommended by Dr. Eberle, by way of revulsion, behind the ears; covering the abdomen, after the leech-bites have ceased to bleed, with an emollient poultice. In other cases, it may be advisable to apply a stimulating cataplasm;[b] and, in protracted cases, a blister, which ought only to be kept on until it reddens the surface, as great local mischief is occasionally produced when blisters are suffered to remain longer.

[a] R.—Rhei pulv. gr. iij.
Magnes. gr. v.—M.

[b] R.—Farin. tritric. p. iv.
Sem. sinapis pulv. p. i.
Aquæ q. s.—M.

If the disease does not yield readily, small doses of calomel may be given frequently, (*Hydrarg. chlorid. mit.* gr. $\frac{1}{6}$—j. every half hour,) to produce a new action, if the child be under two years of age, which is generally the case. In older children—as has been remarked elsewhere—great care must be taken not to affect the mouth by the remedy. Should signs of acidity exist, magnesia in the early period, and prepared chalk subsequently, will be indicated. The chalk may be combined either with calomel,[a] or be given in the form of the *hydrargyrum cum cretâ* of the Pharmacopœias,[1] (two grains every hour or half hour.)

[a] R—Hydrarg. chlorid. mit. gr. $\frac{1}{6}$—j.
Cretæ præpar. gr. iij.—M.

Where irritability of the stomach exists, not relieved by revellents applied to the stomach, injections of salt and water may be used in the way of revulsion; or gentle stimulants may be given internally, as a

drop or two of oil of aniseed in sugared water, or five or six drops of sulphuric ether in the same vehicle.

It need scarcely be said, that, if there be irritation induced by teething, the gums should be freely divided; and, even should the tooth not be set at liberty, the revulsion, thus induced, proves salutary. The warm bath is beneficial at all periods of the disease. In the more protracted cases, but not earlier, as a general rule, it may become necessary to administer astringents. The acetate of lead[a] has been highly extolled by many practitioners. The oil of turpentine has been advised when the little sufferer is harassed with flatulent distension of the stomach and bowels (gtt. iij.—vj.), and it has been of service. With the same view, a few drops of any of the essential oils may be administered.

[a] R.—Plumbi acet.
Pulv. ipecac. comp. āā gr. ½.
—— glycyrrhiz. gr. iij.—M. One, every two or three hours.

Great caution, however, must be used in the employment of excitants and astringents. During the convalescence, any of the gentle tonics—as colomba[a]—or of the milder astringents, may be used; and there may be cases in which it is necessary to administer injections of the infusion of galls, or of starch and laudanum.

[a] R.—Infus. colomb. f℥xj.
Syrup. aurant. f℥j.—M.
Dose, a teaspoonful four times a day.

Throughout the disease, care must be taken in regard to the diet, which may consist of boiled milk, with any of the farinaceous preparations—as sago or arrow root. The appetite is apt to be very capricious, a great desire being shown for salted meat, salt fish, butter, &c.; and it has been esteemed proper to gratify it, occasionally, to a certain extent. There can be no doubt, that in many cases no evil has resulted from such indulgence; but it is manifest, that it should be permitted under the closest circumspection.

To allay the great thirst that prevails, iced water may be allowed, or the child may be permitted to suck ice contained in a piece of gauze.

One of the most important curative agencies is change of air. If the child can bear removal into the country, and circumstances permit, this is the best course that can be pursued. But where this is impracticable, riding, or carrying the patient about in the open air is of essential service. In this city, (Philadelphia,) it is common to take children, affected with the disease, across the Delaware to Camden, or up and down the Delaware in the steamboats, and the effect is often surprising.

As prophylactics, the most important are:—removal during the heat of summer to the country; or, if compelled to remain in town, sleeping on a mattress, with the doors and windows of the chamber open; the daily use of the tepid or cold bath; exercise in the open air, and, if the child be weaned, well-regulated diet, especially abstinence from unripe fruits, and the succulent vegetable. The constant use of a flannel

bandage, even through the heat of summer, is not one of the least important articles of prevention.

Such are the general principles of management, and the chief methods of carrying them into effect. The plan advisable in each particular case must be left—as in every other disease—to the discretion of the practitioner.

V. CONSTIPATION.

Synon. Constipatio seu Obstipatio Alvi, Alvus Tarda, A. Dura, A. Adstricta, Tarda Alvi Dejectio, Obstipatio Alvina, Stypsis, Coprostasis, Obstructio Alvi, O. Ductûs Alimentarii, O. Intestinalis, Intestinorum Torpor, Costiveness, Fæcal Retention, Alvine Obstruction; *Fr.* Echauffement, Ventre Resserré; *Ger.* Leibesverstopfung, Stuhlverstopfung, Hartleibigkeit.

Constipation frequently occurs as a symptom of various diseases—as of enteritis, of mechanical obstruction of the bowels from hernia, internal strangulation, invagination, foreign bodies, cancer of the intestines, lesions of the spinal marrow, colic, &c.—but this is not the form to be considered here.

In the same manner as diarrhœa may arise in consequence of secretory irritation in the mucous membrane of the intestines—such irritation being communicated to the muscular coat—so may constipation be owing to those secretions not being formed in due quantity, and to concomitant torpor of the muscular coat. It is this constipation, which has now to be investigated; the character, and mode of treating that which arises from positive obstruction, being described under the next head.

Diagnosis.—We may define constipation to consist in the fæces being retained longer in the intestines than is customary with the individual; or to their being inspissated so as to render their evacuation tedious and imperfect. It is necessary to include in the definition, "longer than is customary with the individual," inasmuch as there are many persons who, in health, evacuate the canal much less frequently than others. Perhaps, as a general rule, the bowels are evacuated, in health, once a day; but some are in the perfect exercise of their functions, who do not have an evacuation oftener than once a week, or even than once a fortnight; and there are cases on record where the interval has been longer; whilst, on the other hand, there are persons who, in health, never have fewer than two or more evacuations in the twenty-four hours.

When the state of constipation passes beyond certain limits, it generally gives rise to more or less uneasiness, gastric and intestinal disorder, sympathetic headache, and often to febrile irritation.

Causes.—Torpor of the intestinal functions may be induced in various ways—as by change of diet or of habits. Long-protracted study has been conceived to be a cause—the exercise of the encephalic portion of the nervous system detracting from the energy of the abdominal portion; but the true cause in such cases probably is—the interference with accustomed regimen. Defect of the biliary secretion has likewise been looked upon as a cause, but this also is doubtful. The agency of the bile as a stimulant to the mucous membrane of the canal, is more than questionable; but if torpor of the intestines exists, the

same condition is apt to occur in the liver, and diminished secretion of bile is a consequence of such torpor, as an increased secretion, we have said, is produced by excitement in the tube. This torpor, or deficient impressibility of the intestinal canal, is well seen in old people, in whom the fæces collect at times in the large intestines in such quantity as to create a true obstruction, removable only by mechanical agency.

Treatment.—This may be divided into the employment of such remedies as are needed for removing the constipation for the time being, and such as are calculated to develope permanently the impressibility of the canal. Cathartics, in properly regulated doses, suggest themselves for the fulfilment of both indications. It is obvious that, with the first view, the rapid cathartics and forms of administration must be chosen, as castor oil, (f ℥ss.—℥j.,) Epsom salts and magnesia,[a] infusion of senna and salts,[b] or pills of aloes or colocynth,[c] or any of the ordinary cathartics; and if they should not be sufficiently active, croton oil,[d] with the addition of domestic or turpentine enemata, may be thrown up into the colon.

[a] R.—Magnes. sulph. ℥ss.
——— carb. ℥ij.
Tinct. olei menth. gtt. x.—M.

[b] R.—Infus. sennæ f℥xj.
Tinct. sennæ f℥j.
Magnes. sulphat. ℥iij.—M.

[c] R.—Pulv. aloes seu
Ext. colocynth comp. ℈ss.
Hydrarg. chlorid. mit. gr. iij.—M. et fiant pil. iij.—pro dosi.

[d] R.—Ol. tiglii gtt. iv.
Micæ panis q. s. ut fiant pilulæ viij.
Dose, one, two, or more.

In the constipation of children the same course has to be adopted as with the adult. In such cases the author has frequently derived great advantage from the employment of aloes, which may be administered with impunity to children even in very large doses. It occasionally proves successful after other agents have failed, is rarely rejected by the stomach, acts mildly, and, what is perhaps strange, is rarely objected to by young infants, when given in syrup.

R.—Aloes pulver. ℥j.
Syrupi f℥j.—M.
Dose, a teaspoonful from time to time until the bowels are evacuated.

The author has elsewhere detailed cases occurring in his own practice, as well as in that of others, in which two drachms of powdered aloes have been given in this form, in two successive days, without any griping or unpleasant symptom, and with full relief to the constipation. (*Commentaries on the Diseases of the Stomach and Bowels of Children*, p. 92, Lond. 1824; and *General Therapeutics and Mat. Med.* 3d edit. vol. i. p. 172, Philadelphia, 1846.)

In this way, the immediate mischief may be obviated; but although a brisk cathartic removes the contents of the canal, it does not strike at the root of the disease. On the contrary, the constant employment of cathartics in this manner perpetuates the evil; diminished action of the exhalents of the mucous coat and of the muscular coat succeeding to the exaltation of the vital manifestations produced in these tissues by the operation of the cathartics; hence, if cathartics be repeatedly had recourse to, in a habit disposed to constipation, the person, in time, requires so imperiously the stimulation they excite, that he is unable

to have an evacuation without them. The result is, however, more likely to supervene after the action of certain agents than of others. Castor oil and croton oil are more exempt from it than other cathartics, and on the other hand, rhubarb is generally thought to be more obnoxious to the remark than any of the class.

In the torpor of the intestines in which there is a disposition to form scybala, and to retain them in the cavity of the large intestines, the principal remedy, Dr. M. Hall considers to be—a daily aloetic pill and a warm water enema. This plan will certainly succeed generally. The best mode, indeed, of obviating the tendency to constipation, is to avoid—as far as possible—the exhibition of those cathartics that powerfully excite the organs directly and indirectly concerned in defecation, and to trust altogether to the employment of laxatives and an appropriate regimen. The best laxatives, for this purpose, are those that affect the whole intestinal canal, and which possess the property of developing its impressibility. Such are the saline cathartics.[a] By persevering in the use of these for some weeks, the author has succeeded in completely removing the tendency to constipation in some very obstinate cases.

[a] ℞.—Magnes. sulphat. ℥j.
Potass. bitartrat. ℥ij.
Aquæ bullientis Oij.
Dose, a wine-glassful, night and morning.

In like manner, the combination of a laxative and a tonic is often very beneficial,[b] but its use must likewise be persevered in for some time, to break in upon the pathological condition into which time has entered as an element.

[b] ℞.—Carbon. ligni, in pulv. ℈ss.
Magnes. gr. v.—fiat pulvis bis die sumend.

Dr. Chapman states, that from ten drops of the tincture of the root of colchicum, repeated several times in the twenty-four hours, and persisted in for some time, as much may be anticipated in functional constipation, with a view merely to the restoration of the lost susceptibility of the bowels, as from anything else within his experience. He has rarely, indeed, seen it fail.

Occasionally fæces accumulate in the intestines and give occasion to constipation and to violent spasms of the intestines, so that their folds can be seen and felt through the parietes of the abdomen. Such a case was brought before the clinical class of the Philadelphia Hospital by the author, during the session of 1844 and 1845. The fæces were brought away by repeated enemata of soap and water thrown into the colon in sufficient quantity to distend it; after which the patient recovered under the use of appropriate compression exercised over the abdomen and a tonic medication.

To remove the accumulation of hardened fæces, that owe their origin to the great deficiency of impressibility of the canal in old individuals, injections of warm soap and water may be repeatedly thrown into the rectum; but if they cannot be dislodged in this way, it may be necessary to introduce the finger, or the handle of a spoon, or, what is better, the common marrow spoon.

Ox gall has been strongly advised by Dr. Charles Clay, of Manchester, England, and by Dr. Allnatt and others, as a direct solvent to accumulated hardened fæces, the consequence of deficiency of quality or quantity of bile in the alimentary canal. The recent gall of the ox is slowly evaporated to the consistence of an extract, and afterwards made into pills, as in the formula given below; but if sufficiently firm, he prefers the simple extract made into pills without any addition. The gall-bladder of a moderate sized ox will afford as much extract as will make one hundred four-grain pills.

℞.—Fel. bovis. inspissat. ʒij.
Ol. carui ♏ x.
Magnes. carbonat. q. s. ut fiat massa in pilulas xxxvi. dividenda.
Dose, two, three or four times a day.

Dr. Mettauer, of Virginia, employs the inspissated bile of the swine, which differs considerably from that of man and the ox.

A most important assistance to the remedies above mentioned is the proper adaptation of diet and exercise. By simply eating bran bread, or bread made of unbolted flour, or corn bread, ripe fruit, or preserves, figs, stewed prunes, or a free use of saccharine matter, as of molasses, with articles of diet that will admit of the union, the bowels may sometimes be kept entirely soluble in constipated habits, without the use of any cathartic. Regular exercise should also be taken, either on foot, on horseback, or in a carriage, but the first is by far the most advisable. Methodical compression by means of the Russian belt, is often likewise of great service.

Such are the chief agencies for obviating ordinary constipation in which there is no lesion of the digestive tube, and where the whole disorder appears to consist in an obtunded impressibility of the mucous and muscular coats of the intestines, or rather of the nerves distributed to them.

Torpor of the Colon.

This requires a distinct mention; inasmuch as it is frequently overlooked, and yet is doubtless the source of many anomalous symptoms, which are referred to the gastric and cardiac organs more especially. It is defined by Dr. Copland, as follows:—"General debility, with indigestion; slow or irregular state of the bowels, distension, borborygmi or stridulous noises in the course of the colon; frequently pain or uneasiness, sometimes with tumours in some part of this viscus."

The torpor appears to be at times owing to defective action of the system generally, and of the colon in particular; but not unfrequently it seems to be dependent upon narrowness of the canal, which occasions a dilatation of the gut above the straitened part, and in which fæces or air may accumulate, and give rise to all the phenomena of ileus; or by pressure interfere with the functions of neighbouring organs. Occasionally, too, hard tumours—painful, when pressure is made over them—are felt along the course of the colon, especially of the ascending portion. When this is the case, vomiting and other signs of ileus are apt to occur, after which, under proper treatment, the symptoms often speedily disappear.

The author has attended several cases in which various evidences

of dyspepsia existed, with irregularity in the alvine evacuations; generally, constipation alternating with diarrhœa; great irregularity in the heart's action; giddiness, apparently from the condition of the circulation, and indefinable uneasiness referable to the stomach and bowels; these symptoms being frequently relieved after food has been received into the stomach, so that the after part of the day may be passed in comparative comfort.

The treatment must of course be regulated by the cause. If the phenomena indicate general or local debility, or both, the preparations of iron, the subcarbonate or the citrate (gr. xv. three times a day,) or the sulphate of zinc, with the employment of methodical compression by the Russian belt, and a diet easy of digestion, will often be attended with the best results.

℞ R.—Zinci sulphat. gr. iij.
Ext. gentian. gr. ij.—M. et fiat pilula.
One to be taken four or five times in the 24 hours.

This course must be persevered in for many weeks; and it may be necessary to advise change of air, scenery and society, such as travelling affords. The bowels too must be regulated, less by purgatives than by injections thrown into the colon. Repeated cathartics have not appeared to the author to be advantageous.

When narrowness of the canal exists, and it cannot be readily reached by the bougie, brisk cathartics should be carefully avoided, and every endeavour be made to prevent accumulations from taking place in the bowels.

In almost all cases of torpor of the colon, the author has found decided advantage from a generous diet, restricted, however, in quantity, and from the use of a couple of glasses of wine at dinner.

In the attacks of painful colic that not unfrequently supervene in such cases, the best course of management is to administer a pill of opium and calomel,[a] the former of which allays the spasm, whilst the latter exerts a cathartic operation. Violent purgatives have appeared to be positively injurious.

[a] ℞ R.—Opii pulv. gr. iv.
Hydrarg. chlorid. mit. gr. x.
Mucilag. acaciæ q. s. ut fiant pil. ij.
One to be given for a dose, and the other in a couple of hours, if relief be not obtained.

The cathartic action may be aided by enemata of soap and water thrown into the colon by the rectal tube of Dr. O'Beirne, where this can be passed so far. Along with these internal means, the external applications recommended in Enteralgia, may be prescribed.

VI. OBSTRUCTION OF THE INTESTINES.

Synon. Enteremphraxis, Incarceratio Intestinorum Interna; *Fr.* Étranglement des Intestins.

Obstruction of the intestinal canal may arise from various causes, which will require a separate consideration. The symptoms, however, are much alike in all—at first, obstinate constipation; and subsequently, more or less abdominal tenderness and meteorism—the combined symptoms of enteritis of the peritoneal coat, and of constipation,

twisting pains of the bowels chiefly round the umbilicus, with generally inverted action of the intestines, at times vomiting of stercoraceous matter, fæcal odour of the breath, great anxiety, and often rapid sinking. To the aggregate of symptoms just described, the names *Ileus*, *Eileus*, *Colica ileus*, *Passio iliaca*, *Volvulus*, *Chordapsus*, *Miserere mei*; Fr. *Colique de miséricorde*, *C. de Miserere*; Ger. *Miserere*, *Darmgicht*, *Kothbrechen*, have been usually appropriated.

The main affections, which may induce obstruction, are the following:

1. *Hernia.*—This is so common a cause of the congeries of symptoms described above, that whenever the practitioner is called to a case of the kind, he should diligently examine, whether there be not evidence of some portion of the intestinal canal being incarcerated and strangulated, either in the shape of inguinal, femoral, or umbilical hernia. Many lives have been sacrificed to mistakes of this kind, and, accordingly, it is well, as has been often recommended, in every case of enteritis, or of disease similar to enteritis, to search diligently for some cause of obstruction, and especially for hernia. Very recently, the author saw a fatal case of strangulated umbilical hernia, which had been mistaken for one of ordinary enteritis.

Even when no external cause of strangulation may be perceptible there may be internal hernia; portions of the intestine may pass through the diaphragm or mesentery; or, owing to inflammation, loops of intestine may have become adherent; and, by the passage of another portion of intestine through the aperture thus made, strangulation may occur. It is impossible to specify all the anomalous cases of the kind that may present themselves; but one or two may be taken. The corpus fimbriatum of the Fallopian tube has been known to contract adhesions with the rectum, after which the mass of intestines has passed between the bond of union and the sacrum, risen on the opposite side towards the pubis, and again fallen over into the first space, so as to form a kind of running knot. A similar fact has been noticed in the case of the appendix vermiformis cæci. An interesting and fatal case of internal strangulation occurring in the person of a distinguished statesman—the Hon. Hugh S. Legare—has been published by Professor Bigelow, of Boston. On laying open the cavity of the abdomen, it seemed nearly filled by the sigmoid flexure of the colon, which extended across the abdomen into the right hypochondrium, and was so largely distended, that its external circumference was in one place fifteen inches. The two extremities of the flexure, connected with the colon above, and the rectum below, were felt to be twisted together, about the mesentery as an axis, into a firm cord or neck, about an inch in diameter; and on being carefully untwisted, the whole included portion was found to have made four turns, or two entire revolutions upon itself. The rectum was rather contracted. This very day, (September 21, 1843,) the author has examined a case, which he saw the day before its fatal termination, in consultation with Professor Pancoast, and Dr. Stickney, in which the internal strangulation, that gave rise to obstruction of the bowels of a week's duration, was caused by a fibrous band extending from the left lobe of the

liver to the anterior surface of the stomach. Through this the whole of the sigmoid flexure of the colon had passed; the rectum and mesorectum being greatly elongated. The female had been delivered about a week prior to her death; and it is probable, that the band had formed during pregnancy; and that the sigmoid flexure of the colon had passed beneath it at that time. As soon, however, as delivery took place, the incarcerated portion with its contents gravitated towards the pelvis, the constriction becoming greater and greater, and ultimately inducing all the symptoms of ileus. A case has, also, been reported by Dr. McPheeters, of St. Louis, Missouri, in which the ileum was found twisted on itself, so as to have made three entire revolutions.

2. *Diminution of the calibre of the intestines.*—Chronic inflammation of the intestinal parietes may give occasion to adhesions of the intestines; and obstructions may likewise arise from scirrhous, cancerous, and other degenerations, which may be suspected from the presence of the symptoms, that characterize those affections. A case has been published by Dr. Holscher, in which ileus was occasioned by hypertrophy of the pancreas. A diminished calibre of the rectum or sigmoid flexure of the colon often gives occasion to torpor of the latter intestine. (See page 154.)

3. *Imperforation of the Intestinal Canal, Atresia ani adnata, Anus imperforata, Imperforatio ani;* Fr. *Imperforation de l'anus;* Ger. *Natürliche Verwachsung des Afters,* is congenital, and evident on examination.

4. *Intussusception, Convolvulus, Volvulus intestinorum, Chordapsus, Intussusceptio, Invaginatio, Introsusceptio, Indigitatio, Tormentum;* Ger. *Darmeinschiebung, Einschiebung der Gedärme, Innere Zusammenschnürung der Gedärme, Verwickelung der Gedärme,* is caused by one portion of the intestinal canal becoming invaginated in another. Owing to augmented peristaltic or spasmodic action of the intestines, it can be understood, that an upper portion of the intestines may be forced down into a lower, and that, owing to an action in an opposite direction, a lower portion may be forced into an upper. The former of these lesions is termed the *progressive*—the the latter, the *retrograde* form.

Cases of invagination are not uncommonly met with in the dead body; but that these have been accidental, and occurred probably during the last acts of life, is shown by the circumstance, that they can be easily reduced; whereas the invagination, that gives rise to symptoms of ileus, is accompanied by an inflammatory action, which causes the adhesion of the peritoneal surfaces to each other, so that the intussusception cannot be reduced after death. Owing to the narrowness of the canal, and the obstruction thus induced, the symptoms of ileus supervene.

Accidental intussusception may be produced on animals, in the way of experiment; and cases of this nature are doubtless meant, when it is affirmed, that of 300 children, who died either from worms or the fever of dentition, at La Salpétrière, the greater part had two, three, four, and even more, intussusceptions. It may take place in any part of the alimentary canal; but, most commonly, in the ileum,

near where it terminates in the colon. This appears to be the result of the cases that have been collected. Sometimes, the invaginated portion sloughs away; and there have been cases in which several feet of intestine have been discharged *per anum*, with more or less of the mesentery attached. In one case, which fell under the observation of Dr. Forbes, no less than eight portions of intestine, varying from eleven to thirty-two inches in length, were passed by stool,—the length of the whole amounting to twelve feet of entire intestine. Each portion was complete in itself, presenting the appearance of healthy intestine that has been allowed to remain a certain length of time in alcohol. They consisted of the jejunum and ileum. The patient—a female—completely recovered from the immediate consequences of the disease. The first portion of the intestine came away in the year 1826; the last in 1829. She died in March, 1831, aged thirty-seven years.

In thirty-five cases collected by Dr. Thompson, the average duration of the disease was between four and five weeks. In twenty-two, the evacuated portion appertained to the small intestines; in the other, to the large, or to both.

Where the invagination has proceeded to a great extent, or where the small intestines with the cæcum have passed down into the sigmoid flexure of the colon, as in some cases that have been related, the seat of the disease was manifested by a hard tumour: and in less marked cases careful examination has detected the existence of a deep-seated tumour.

5. *Extraneous bodies in the intestines*—as cherry-stones or plum-stones, which have been detained in some part of the intestinal canal; fragments of bones or calculi from the biliary ducts may, in like manner, be the cause of obstructions, which may or may not be indicated by careful examination of the abdomen. A case of death from extensive intestinal and peritoneal inflammation resulting from a perforation of the coats of the intestine, occasioned by a calculus lodged in the appendix vermiformis cæci, has been published by Dr. J. F. Peebles, of Petersburg, Virginia, and many such are on record. Singular cases, in which milk, used freely as a diet, accumulated in large masses of a cheesy nature, producing gastric oppression or unrelenting obstruction of the bowels, with the alarming consequences of such conditions, have been detailed by Dr. Chapman. Coins are not unfrequently swallowed, accidentally, and much uneasiness on the part of patient and friends is not unfrequently the result. Many cases have been recently referred to by Dr. Wm. Campbell, with the view of elucidating this matter. He was sent for to see a child, three years of age, which had swallowed a farthing. The coin was discharged on the fifteenth day; and no uneasiness was occasioned by its detention. In two other cases, in which children swallowed a similar coin, it was evacuated on the third day. In two other cases, where the children swallowed a half sovereign, the coin was retained for three months. Dr. A. T. Thomson relates the case of a boy, who swallowed a penny, which did not make its appearance *per anum* for six months afterwards; and another case of a younger boy, who swallowed a similar coin, which was discharged in two months. In neither case did the

coin exert any injurious effect on the health. Dr. Paris mentions a case in which six pennies were swallowed, and remained six years in the intestines; and Dr. Baillie records a case in which, on dissection, he found imbedded in a pouch in the stomach a coin which had been swallowed some considerable time previously.

Pathological Characters.—The pathological characters vary according to the precise cause of the obstruction, as well as to the length of time it has existed. Generally, signs of inflammation, or of its terminations—as effusion of coagulable lymph, gangrene, &c.—are present; and the intestine, above the seat of obstruction, is usually distended for a greater or less extent—at times, to three or four times its wonted diameter.

Treatment.—When the aggregate of symptoms, described above as constituting ileus, occurs, and the ordinary remedies for constipation have been tried in vain, it becomes questionable, no matter what the cause of the obstruction may be, whether the disease should be at all treated by cathartics, at least by such as are given by the mouth: if any are administered, they ought to be in the form of enema. The great object must be—if a careful examination should detect hernia—to remove the strangulation; but, as it is not easy to detect the other pathological conditions that may give rise to the disease, it had better be treated upon the principles laid down under Inflammation of the Peritoneal Coat, of which there is always more or less present.

It can be readily seen, that if the cause of the symptoms be intussusception, cathartics must be doubtful remedies. The only hope we have—when adhesion between the peritoneal surfaces, has taken place, and the invaginated portion has become fixed in its position—is, that the protruded part of the intestine may be thrown off, and a cure be thus obtained, of which, as has been remarked, many cases are on record. In the meantime, inflammation must be subdued by blood-letting—general or local, or both; by full doses of opiates, the warm bath, and the other remedies adapted for peritoneal enteritis.

Metallic quicksilver has been recommended by a host of writers in intussusception, and indeed in every case of obstruction of the bowels. Where extraneous substances exist in the canal, it might possibly be of use by driving them onwards; but it is not easy to divine the principle on which it has been advised, both in older and in more modern times, in intussusception. If the invagination be of the progressive kind, the mercury must pass through the invaginated portion; and if retrograde—the least common form—the same thing would happen; or by getting between the intestine and the invaginated portion it might aggravate the disease. In no case, consequently, could it be useful, whilst it might certainly be prejudicial. The quantity administered has been great—from an ounce and a half to six ounces for a dose—until pounds have been swallowed.

In all cases of ileus, the forcible injection of large quantities of warm water, or of air, has been advised; and it is possible, before any adhesion has taken place, that in cases of progressive intussusception, advantage might be derived from this course, and the invaginated portion be made to resume its proper position: where, too, hardened fæces or

impacted substances of any kind are the source of the obstruction, the injection of warm water might remove the mischief. A long elastic gum tube, adapted for such cases, should be passed into the sigmoid flexure of the colon, and the material of the injection be sent through it. When it is air, it may be forced in by means of a common pair of bellows attached to the tube. It has been advised also, in cases of suspected intussusception, to introduce long bougies, and even pieces of whalebone into the rectum, for the purpose of pushing back the intussuscepted portion; but a case can hardly be imagined in which such agents can be appropriate.

Emetics have been suggested in cases of progressive intussusception, yet, although the recommendation proceeds from high authority, it cannot be indulged for a moment. They could only be serviceable before agglutination had occurred; and, besides, one of the evidences of the invagination is the antiperistaltic action already established. Under the same reasoning, cathartics ought to be advised in the retrograde kind.

Lastly—Where the evidence has been very strong as to the presence of intussusception, and its seat, the operation of laparotomy has been advised, with the view of disentangling the invaginated portion of the bowel, but it has been properly discountenanced by almost all therapeutists, and for the best of reasons. The symptoms of invagination are always obscure and doubtful, and may be produced by other states of the digestive tube, that have been mentioned; so that if the abdomen were opened, it might be found that no intussusception existed; or if it did, that owing to the agglutination, no separation could be effected without producing, if possible, a more speedily fatal lesion. These circumstances, it would seem, ought to render the operation wholly inadmissible; yet successful cases are on record. At a meeting of the Tennessee State Medical Society, Dr. J. E. Manlove reported two, which are published in the *Boston Medical and Surgical Journal* for July 23, 1845.

In cases of obstruction from diminution of the calibre of the colon at its lower portion, it may be advisable, as a last resource, to establish an artificial anus in the lumbar region, in that portion of the intestines not covered by the peritoneum. In the older operations in the iliac region, the peritoneum was wounded, and this circumstance was supposed to have been the chief cause of death in numerous cases. Callisen proposed to make a vertical incision, extending from the edge of the false ribs parallel to the anterior border of the quadratus lumborum muscle; and in this way hoped to reach the colon between the layers of its short and imperfect mesentery. The operation appears, however, to have been attended with some difficulties, until it was modified by M. Amussat, who affirms, that the failure of the operation on the dead subject is owing to the intestine being empty, whilst in the cases that require the formation of an artificial anus, the colon is greatly distended; in which case, the layers of the peritoneum forming its imperfect mesentery are so far separated as to permit the intestine to be reached without opening the peritoneum. M. Amussat uses the transverse, instead of the vertical incision. He has performed the

operation five times, four of the cases being perfectly successful. The subject of the fifth case died on the tenth day, from the progress of the carcinomatous disease, but experienced great relief from the artificial opening. It has also been performed by others, and occasionally with success.

VII. ENTERALGIA.

SYNON. Colica, C. passio, Colicodynia, Dolores Intestinorum, Dolor Colicus, Tormina, Dysenteronervia, Anenteronervia, Gripes, Mulligrubs, Bellyache; *Fr.* Enteralgie; *Ger.* Darmschmerz, Bauchgrimmen, Kolik, Leibschneiden, Bauchweh.

The term *enteralgia* or *colic* is applied to any severe griping pain of the bowels, and the affection, in this sense, is an accompaniment of most of the morbid conditions of the digestive tube. The latter term, however, has, in common parlance, been extended to pain in the uterus, and we have even heard it occasionally applied to a sharp pain in the shoulder. The French speak of *Colique menstruelle*, and *Colique utérine*, to signify, respectively, the pain that precedes or accompanies the menstrual flux or its suppression, and any pain which has its seat in the uterus,—*hysteralgia*. Etymologically, it doubtless meant pain in the colon. Many varieties of enteralgia have been admitted by different writers: some of the Germans have described not fewer than twenty. The chief forms may, however, be discussed under three heads:—1. *Common colic;* 2. *Bilious colic;* and 3. *Painter's colic.*

a. *Common Colic.*

Diagnosis.—The general characters of common colic are:—Violent pain usually occurring suddenly in some part of the abdomen, with a sense of twisting about the umbilicus, or in the course of the colon. The pain is excessive, and not augmented by pressure, as in enteritis: on the contrary, it is usually alleviated by it: it also remits, and presents all the characters of spasm:—hence, the name *spasmodic colic* given to it by some. It is usually accompanied by borborygmi, constipation, and more or less flatulence, by the discharge of which relief is afforded. The face has generally an expression of great anxiety and suffering, which might be called, by the medical physiognomist, *abdominal;* the pulse is small, and often entirely unaffected. The condition is clearly neuropathic, and ceases in a few hours by the removal of its cause. It must always, however, be borne in mind, that every variety of colic may end in inflammation; and that the remedies, which are adapted for the two pathological conditions, are essentially different. At times, vomiting is associated with the symptoms above described, and the affection may assume all the characters of ileus, which has, indeed, been classed as a form of colic by most writers.

Causes.—The causes of simple colic are, generally, indigestible aliment, or acid substances passing down the intestinal tube. In children, it is a common result of the predominance of acid, and is often owing to the mother's milk disagreeing with the child. The precise pathological condition of the *colica flatulenta* or *flatulent colic*, (Fr. *Colique flatulente* ou *flatueuse;* Ger. *Blähungskolik*,) seems to be over-distension of some portion of the intestinal tract, which, by occasioning compression or stretching of the nerves, excites the pain. In other instances it is

spasm of the nerves, occasioned by irritating contents of the tube; in which case it often receives the name *Colica stercoralis;* Ger. *kothiger Durchfall.*

Treatment.—In all cases of simple colic, the first and great object is to relieve the spasm, which, when flatus is the cause, may be done by the internal administration of excitants termed "carminatives." The pain, as we have seen, is owing to the partial over-distension of some part of the intestinal canal; and, if a carminative be administered, the excitement it produces in the mucous membrane with which it comes in contact, is extended, by contiguous sympathy, to the muscular coat, which is aroused to greater contraction, and, in this way, the flatus is diffused:—a part may escape through the cardiac orifice of the stomach, or it may descend into the lower intestines. In like manner, in cases of tormina or simple colic, caused by irritating substances in the canal, aromatics are serviceable, by the increased peristaltic action, which they induce, hurrying on the contents of the canal; accordingly aromatics are frequently added to cathartics which are apt to induce griping. The aromatics given are numerous. In the adult, the essential oils of vegetables are generally preferred,—sometimes dropped on sugar—as the oil of caraway, or aniseed, or peppermint, (gtt. v.—x. for a dose); but, in children, infusions of those seeds, or of some aromatic vegetables, are more frequently chosen. Even in simple cases of griping, however, it is advisable, if the carminatives be not entirely successful, to unite cathartics with them. Castor oil (ʒij.—ʒiv.), taken in peppermint water, or in water to which ten drops of an essential oil have been added, generally answers the purpose well; but, should it not, the dose may be repeated, or a cathartic enema be exhibited. To infants a similar union of cathartics and aromatics may be prescribed;[a] the action of which may be aided by a suppository of yellow soap.

[a] ℞.—Rhei pulv. gr. iv.
Magnesiæ vel
Magnesiæ carbonatis gr. xij.
Olei anisi gtt. iv.
Aquæ ʒj.—M.
Dose, a teaspoonful, to be repeated occasionally.

In more severe cases of colic, in which the pain is excessively severe, the object must be to remove—as soon as practicable—the constipation by cathartics—as castor oil, or infusion of senna with the sulphate of magnesia[a]—or the ordinary cathartic enemata may be thrown up.

[a] ℞.—Infus. sennæ fʒiv.
Magnes. sulph. ʒj.
Tinct. sennæ fʒss.—M.
Dose, a third part, every hour until it operates.

It is advisable, in such cases, to introduce a hollow bougie into the colon; and, if flatus exist there, relief is afforded by the passage of the air through the tube; but, should not this be the case, the materials of the enemata may be thrown up through the tube.

In addition to this treatment, friction over the abdomen with the warm hand, or flannels wrung out of hot water; or caloric applied in

any other way, as by heated salt, bottles filled with hot water, &c., may be used with advantage.

In all cases, if any doubt exist, whether there be concomitant inflammation, bloodletting may be practised; and, even should there not be inflammation, the operation of the cathartic is favoured thereby. The union of a nauseant with a cathartic has a similar effect—as by adding to the mixture of salts and senna, prescribed before, two grains of *tartrate of antimony and potassa.*

Opium has been regarded as a doubtful remedy, until the bowels are evacuated. Such is not the result of our observation or reflection. Any agents, that allay the spasm, will tend to aid the action of the cathartic; and, as opium is a precious antispasmodic, it may be unhesitatingly prescribed, in conjunction with the other remedies; but it must be administered in a full dose, (gr. iiss. of *solid opium*, or 50 or 60 drops of the *tinctura opii.*) There is more doubt, as has been well urged by Dr. Cook, of Buskirk's Bridge, New York, of the propriety of the indiscriminate use of cathartics in all cases of enteralgia. (The author's *Medical Intelligencer*, January, 1842.)

b. *Bilious Colic.*

Synon. Colica biliosa; *Fr.* Colique bilieuse; *Ger.* Gallenkolik.

Bilious colic is generally ascribed to a vitiated condition of the bile; but this is a secondary result in the generality of cases. The disease consists essentially in great impressibility of the nerves of the digestive tube, under which a neuropathic condition is often induced; this extends to the liver, which, under the excitement, increases its secretion of bile; and, in the same manner, an increase and a morbid condition of the different intestinal secretions are occasioned.

Diagnosis.—Prior to the appearance of the symptoms proper to bilious colic, the patient usually suffers under disorder of the stomach and intestines; bitter taste; yellow fur on the tongue, nausea, vomiting, want of appetite, oppression at the epigastrium, &c. When the colic occurs, the pain is excessively severe, cutting, and screwing. It is often experienced, first, in the region of the stomach, and stretches to the back in the course of the duodenum; at other times, it affects the intestines generally, and twists around the umbilicus as in ordinary colic. The thirst is great, and anxiety and restlessness are attendants. After a while,—spontaneously, or through the efforts of art,—bilious vomiting supervenes; and the bowels, which had been previously constipated, or with scanty discharges, are evacuated freely—the fæces being largely mixed with bile. The symptoms then gradually abate, and terminate in entire restoration to health. Very commonly, the disease is attended with fever, and the severest forms are apt to end in inflammation of the intestines, and death.

Bilious colic occurs sporadically in summer and autumn, the seasons in which erethism of the mucous membrane of the intestines, and consequent disorders of the biliary system are frequent. In like manner, it is more common in hot climates, in some of which it is almost endemic. Epidemically, it occurs often.

Treatment.—The great indications of management are—*first*, to re-

move the spasmodic condition of the canal; *secondly*, to evacuate the morbid secretions; and *thirdly*, to prevent the occurrence of inflammation.

In plethoric and active habits, bloodletting may be advised from the arm; and frictions and stimulating cataplasms to the abdomen. Glysters of turpentine, and in very severe cases of Epsom salts, or castor oil and opium,[a] or large quantities of warm water containing laudanum, may be thrown up into the colon; and should these remedies not be successful, full doses of opiates may be administered internally (*pulv. opii* gr. iiss. for a dose,) and repeatedly, until relief is obtained.

[a] R.—Theriac. com.
Aquæ aā Oss.
Ol. ricini f ℥ij. vel
Magnes. sulphat. ℥iss.
Tinct. opii gtt. lx.—M.

Barley water may be freely allowed, and, when the cramp has been removed, or greatly alleviated, should there be any tendency to inflammation, leeches may be applied over the abdomen, and after they have dropped off, a large, hot, emollient cataplasm, of bread and milk, or of linseed meal, may be spread over the abdomen. To remove any irritating matters, that may be contained in the upper part of the canal, one of the milder cathartics, as castor oil or magnesia, may now be prescribed, and, if necessary, its action may be facilitated by the administration of appropriate enemata.

c. *Painters' Colic.*

Synon. Colica Saturnina, Colicoplegia, Morbus Metallicus, Colica Pictorum, C. Figulorum, Colica Rhachialgia, Palmus Plumbarius, Enteralgia Saturnina, Lead Colic; *Fr.* Enteralgie Saturnine, Dysenteronervie Saturnine, Colique Saturnine, C. des Peintres, C. de Plomb, C. des Plombiers, C. Métallique, C. des Barbouilleurs; *Ger.* Bleikolik, Malerkolik, Hüttenkalze.

Under this name is comprised only that variety of colic, which is induced by lead,—not the forms of colic, to be mentioned presently, which, although resembling in their symptoms the lead colic, are dependent upon other causes. The *colica Pictonum* or *colic of Poictiers*, for instance, is confounded, by most of the English and American writers, with the *colica pictorum* or *painters' colic.* The same may be said of the *colic from copper*, and the *colic of Madrid.* Most persons, who deal much in the preparations of lead, experience at one time or other, its injurious effects upon the system.

Diagnosis.—Before the symptoms of painters' colic present themselves, there are evidences of the effects of lead upon the system, to which a recent writer, M. Tanquerel des Planches, has given the name *intoxication saturnine primitive.* The principal marks of this condition, this *lead cachexia*, are said to be—a peculiar bluish or bluish-gray tinge of the gums, which sometimes extends over the mucous membrane of the mouth generally, and which has been regarded by Dr. Burton, as an infallible proof of the presence of lead oxide in the system. The teeth, at the same time, become discoloured, and affected with caries; there is a sweetish, styptic astringent taste in the mouth, with

a peculiar fœtor of the breath; sallowness of the skin, and dull, yellow tinge of the conjunctiva; general emaciation; small, soft, compressible pulse, and, in rare cases, a considerable reduction in the number of its beats. Of these symptoms, the discoloration of the gums and teeth is most frequent and most characteristic; and it is considered to be owing to the deposition of a very minute film of sulphuret of lead on the mucous surface, and on the enamel of the teeth.

The importance of attending to these premonitions is exhibited by the fact, that of 1217 cases of lead colic, which fell under the care of M. Tanquerel des Planches, 1195 were previously affected with one or more of the symptoms above mentioned; and, in many instances, by attending to these premonitions, with temporary cessation from work, the threatened attack of lead colic was prevented.

The pain of the abdomen, which, when the disease is fully formed, is so excruciating as to cause the strongest individuals to writhe about, and to weep like children, sometimes comes on suddenly; but, most commonly, it is immediately preceded by signs of gastric and abdominal derangement, and by scantiness and infrequency of the alvine evacuations. When the disease is fully formed, the pain is agonizing, and exhibits remissions and exacerbations. As in other cases of colic, it may be relieved by pressure, but this is not always the case; and at times it is aggravated by it. The abdomen may exhibit various characters. It may be natural, or fuller than natural, but more frequently it is retracted, and feels hard. The pain, in certain cases, shoots through to the back, so as to give rise to the symptom which has given it the name *rhachialgia*, with some. The bowels are almost invariably constipated; such was the case in 1140 out of the 1217 instances, and, when evacuations are procured, they are generally scybalous, and often similar to those of sheep. With these symptoms, there may be conjoined nausea and vomiting—at times, of a bilious character. The pains are not, however, limited to the abdomen; very severe suffering is frequently experienced in the limbs, especially in the upper; followed by debility of the extensor muscles, which may lose all power, become paralytic, shrink, and almost disappear, (*Lead palsy, Paralysis saturnina;* Fr. *Paralysie saturnine.*) Occasionally, the organs of sense, as the touch, sight, and hearing, participate in the loss of power. In the midst of all his sufferings, the patient's pulse is slow, and the skin natural; but there is a striking alteration in the expression of the countenance, which indicates extreme anxiety, and intense suffering. The eyes are deeply sunken in the orbits, or sometimes thrust prominently forward from their cavities; they are surrounded by a bluish circle, are muddy and wild, and, with the other parts of the face, in constant motion, vividly expressive of the different degrees of pain experienced by him. The nose is somewhat pinched, and the cheeks become hollow. In unfavourable cases, delirium, violent spasms and convulsions supervene, (*encèphalopathie saturnine,*) which are the precursors of dissolution.

The duration of the disease is regulated by its intensity. It rarely happens, however, that the patient experiences full relief from a treatment of less than a week's continuance. In the large mass of cases, it

terminates favourably. This is shown by the fact, that of 500 cases treated at La Charité, in Paris, only five had a fatal issue; and in 3,569 collected cases, according to M. Bouillaud, there were only 95 deaths, making the mortality but 1 in 30. When the patient recovers from an attack, he is very liable to relapses. Sudden death is an event, which occasionally happens.

The same care is required in this as in the other varieties of colic, to guard against the supervention of enteritis.

Causes.—The occupations, in which lead is most used, are those which give rise most frequently to colica pictorum. The makers and grinders of colours, painters, plumbers, potters, type and other founders who use lead, printers, miners, &c., are those in whom it is usually witnessed. The workers in white lead appear to be most subject to the disease; and the more volatile the lead is rendered, the more readily does it appear to affect the system. Painting the "dead white," or "statuary white," according to Dr. Stokes, is the most deleterious form of using lead, to the house painter. In this case, white lead is used, combined with a large proportion of oil of turpentine, and the outer air is excluded, as much as possible, so that the air of the apartment becomes strongly impregnated with the lead. It would seem, that the deleterious effects of lead are chiefly produced by the carbonate. The acetate rarely gives rise to lead colic, and when it does, it is presumed to have become converted into the carbonate. To avoid this conversion, it has been advised to add a little acetic acid, in all cases in which the acetate is given.

It has been an interesting question, as to the mode in which the lead enters the economy. Unquestionably, lead colic is occasionally induced by particles of the metal getting upon the fingers, and being swallowed, where due cleanliness has not been adopted. That this is the mode in which it is at times received into the system, is, indeed, sufficiently shown by the fact, that at an extensive smelting establishment, in Cornwall, England, at which cases of lead colic were common, the disease was almost abolished, after an order had been issued and strictly enforced, that no workman should be permitted to partake of food until he had washed his hands carefully, and had the assistance of a nail-brush. Still it occurs, notwithstanding every precaution; and there is great reason to believe, that the channel, by which the lead is most commonly received into the system, is the air passages. It has been affirmed by M. Gendrin, that it is necessary for the metallic particles to be dispersed in the atmosphere, either alone, or by the agency of some volatile vehicle, in order that colic should be induced; but there is no doubt, that it may be produced through the medium of the digestive tube, and even endermically, by simple contact of the lead with abraded surfaces. Lead colic has been induced by the litharge and sugar of lead added to wines and cider, by the use of water kept in leaden cisterns, and by the impregnations of lead communicated to beer, soda water, &c., when suffered to remain in leaden pipes. It would seem, however, that certain individuals are more liable to lead disease than others; and that so great a diversity exists in this respect as to render it impracticable to

determine the quantity of lead which the economy can bear in the way of medicine. Daily experience exhibits, that the acetate may be given in large quantities, without the supervention of unpleasant symptoms.

Pathological Characters.—Different appearances have presented themselves on dissection, but none have been sufficient to throw light on the nature of the disease. In many cases, it is true, redness, thickness, and ulceration of the mucous membrane of the bowels were perceived, the ulcerations being almost always found towards the termination of the small intestine; but these signs of inflammation must be regarded as complications occurring in the course of the disease, and the tendency to inflammation must, accordingly, be borne in mind by the therapeutist. The disease must be regarded as a neurosis of the intestinal tube—or, in other words, as an affection of the nervous system, without any manifest organic change, and this affection seated in parts of the nervous system only—in nerves distributed to the intestines as well as to the extremities; but there is no evidence, so far as dissection has hitherto shown, of disease in the brain or spinal marrow. The membranes and substances of the brain have presented their healthy character; there has been little or no fluid in the ventricles; the spinal cord has been healthy, and of natural consistence, and there has been no effusion between it and its membranes. Notwithstanding, however, the absence of morbid appearances, it has been still presumed, that the seat of the disease is probably the spinal marrow, and that to this organ we must look for the morbid appearances. We have already remarked, that, thus far, the examination of the spinal marrow has afforded no satisfactory results, nor are we likely to obtain any in relation to the essence of the disease. If it be—as we presume it is—a neurosis, the morbid appearances would be altogether secondary. Andral, whilst he combats the idea of the disease being a gastro-enteritis, and esteems it a neurosis, is disposed to refer it to the spinal prolongation, and the abdominal plexuses of the great sympathetic; the constipation being owing—in his opinion—to the destruction of the contractile movements of the intestines, or to the suspension of the secretion from the mucous membrane. In the cachectic condition induced by the influence of lead, he found that the globules of the blood experienced as great a diminution as in spontaneous anæmia; and that, as in the latter, the fibrin and other elements of the blood preserved their healthy proportion.

Treatment.—As the disease is a neurosis or neuralgia of the nerves destined more especially for the intestines, it would seem that opium ought to be a very energetic agent; and, accordingly, it was recommended long ago, and in very large doses. It still holds its ground as a valuable remedy in the disease, and is, by many practitioners, the first prescribed. A full dose of opium, (gr. ij.—iij.) instead of adding to the constipation, tends to remove it, by allaying the spasm, the real seat of which is in the nerves in question. Nor does it interfere with the administration of other remedies. Mercury, which—it has been advised—should be pushed to salivation, can be readily associated with it.

℞.—Hydrarg. chlorid. mit. gr. v.
Opii pulv. gr. ij.—fiat pilula.

This pill may be repeated at short intervals, say every half hour—until a decided impression is made upon the system by the narcotic; and under its action the mercury will probably exert its peculiar agency, or will remove the constipation. To aid this, powerful glysters of turpentine[a] may be thrown into the colon. The patient may be placed in the warm bath, and tobacco stupes be applied to the abdomen to induce relaxation of the spasm; but, in violent cases, a tobacco enema[b] may be thrown up every four or six hours, until a decided effect has been produced on the system.

[a] ℞.—Ol. tereb. f℥ij.
Vitell. ovi ij.
Theriac. commun.
Aquæ aa Oss.—f. enema.

[b] ℞.—Tabac. ℥ss.
Aquæ bullient. Oss.—M.

Along with this treatment, active cathartics may be given freely, as the sensibility of the canal is so greatly obtunded. M. Grisolle maintains, that more prompt and durable relief is afforded by drastics than by opium. There is no reason, however, why they should not be associated. Croton oil forms a valuable cathartic, either alone[a] or associated with the oleum ricini;[b] or the latter may be given alone or combined with the oleum terebinthinæ;[c] and it may be advisable to continue them for two or three days, even should the colic have ceased.

[a] ℞.—Olei tiglii gtt. iv.
Micæ panis q. s. ut fiant pil. iv.
Dose, a pill every two hours until they operate.

[b] ℞.—Ol. ricini f℥iss.
Ol. tiglii gtt. iv.
Pulv. acaciæ ℥iij.
Sacchar. ℥j.
Aquæ menth. f℥iv.—M. Dose a tablespoonful, every two hours.

[c] ℞.—Ol. ricini f℥iss.
Vitell. ovi
Syrup. f℥iij.
Ol. terebinth. rectif. f℥ss.
Aquæ menth. f℥iv.—M. Dose, two tablespoonfuls, every hour or two.

In the hospital La Charité, Paris, a "treatment" has been long prescribed, which consists of a combination of emetics, cathartics, narcotics, and diaphoretics, and is altogether routine in its character, and most operose; but, notwithstanding, followed by some of the best pathologists of France—for example, by MM. Louis and Andral—as implicitly as it was by their earlier predecessors. Yet it is passing strange, that any supporter of the numerical method especially should retain for an instant so complex and unsatisfactory a process; to test the value of which every article ought to be administered singly, and afterwards in combination with the other articles, and the results be compared with those observed in cases where little or no treatment has been pursued. We shall see, presently, indeed, that the disease frequently ends most happily under the most simple or expectant management.

The *Traitement de la Charité* of the present day, as given by M. Grisolle, is as follows:

First day. *Eau de casse avec les grains* (decoction of two ounces of *tamarinds* in Oij. of *water;* add *tartrate of antimony and potassa*, two grains). For drink, *simple*

sudorific tisane (decoction of guaiacum). In the morning, a *purgative lavement* (infusion of senna—*senna* ʒij.; *water* Oj.; *sulphate of soda* ʒij.; *diaphœnix electuary* ʒj.; *powdered jalap* ϑj.) In the evening, an *anodyne lavement* (*walnut oil* ʒiv.; *red wine* ʒx.); *soothing bolus* (*theriac* ʒj.; *opium* gr. ¼).

SECOND DAY. *Eau bénite* (*water* Oj.; *tartrate of antimony and potassa* gr. iv.) *Simple sudorific tisane; purgative lavement,* for the morning. In the evening, the *anodyne lavement, theriac and opium,* as above.

THIRD DAY. *Laxative sudorific tisane,* two glasses (*infusion of senna* and *decoction of guaiacum,* equal parts, Oij.) *simple sudorific tisane; purgative lavement; anodyne lavement; soothing bolus,* as above.

FOURTH DAY. *Potion purgative des peintres,* in the morning (*senna* ʒij.; infused in Oss. of *water; diaphœnix electuary* and *syrup of buckthorn,* of each ʒj.; *powdered jalap* ϑj.) *simple sudorific tisane;* in the evening, the *bolus of theriac and opium.*

FIFTH DAY. *Laxative sudorific tisane,* two glasses; *simple sudorific tisane; purgative lavement;* in the evening, *anodyne lavement; theriac and opium.*

SIXTH DAY. *Purgative potion* in the morning; *simple sudorific tisane; purgative lavement; anodyne lavement; theriac and opium.*

SEVENTH DAY. *Laxative sudorific tisane; simple sudorific tisane; purgative lavement; anodyne lavement; soothing bolus.*

During this treatment, the diet is restricted; and, in general, *bouillon* is begun with on the fourth or fifth day, and afterwards gradually increased in quantity.

Opinions have fluctuated as to the utility of bloodletting in this disease. There are doubtless cases in which it might be beneficial in resolving the spasm, and in rendering the system more susceptible of the action of cathartics. The opinion of the French practitioners is not, however, in favour of bloodletting, either general or local. The cures, it is affirmed by M. Andral, have not been so speedy, and the relapses more frequent. In the cases, which have fallen under the author's observation, he has not found occasion to employ general bloodletting; but the application of cups and leeches has afforded great relief, along with full doses of opium, calomel, and the other cathartics before recommended. There may, however, be cases in which general bloodletting may act not only as a potent antispasmodic, but may facilitate, as before remarked, the action of the mercurials and cathartics. Revellents may likewise be serviceable, of which the best is a blister over the abdomen, which may be dressed with a mixture of mercurial ointment and morphia.

℞.—Ung. hydrarg. ʒj.
Morphiæ acet. gr. x.—M.

Where the stomach rejects medicine, reliance must be reposed on the revellent action of the blister, on the dressing just recommended, friction with mercurial ointment over the inner surface of the arms and thighs, and powerful cathartic enemata with the addition of opiates. Often, the symptoms, although previously obstinate, yield to the specific effect of mercury on the system. Sometimes, copious enemata of cold water thrown into the colon have induced an increase in the peristole of the intestines, when everything else had failed.

Alum (gr. xv. to ʒij. every 4th, 5th, or 6th hour) was recommended many years ago by Dr. Percival, and it was affirmed, that the third dose seldom failed to alleviate the pain. Of late years it has been again extolled, as well as sulphuric acid lemonade. M. Gendrin affirms, that he has cured more than 300 cases, by administering daily from a drachm to a drachm and a half of sulphuric acid diluted in three or four pints of water. The cure was obtained in three or four

days. The experience of M. Gendrin has been corroborated by that of other observers, but the same agent has been found entirely useless by MM. Grisolle, Tanquerel des Planches, and others. The disease, however, in many cases, terminates in health under very simple management. Of thirty-one cases, in which nothing but the ordinary *tisane* of the French hospitals was given for twelve days, three were cured by the fourth day, two between the fifth and eighth days, ten between the eighth and twelfth days, and one on the thirteenth day: the remaining cases were subjected, after the twelfth day, to the purgative treatment, under which they were quickly cured. Dr. C. J. B. Williams's treatment consists in the exhibition of powerful purgatives, combining them with belladonna in order to relieve the excessive pain; and following this course up with alum, when the bowels have been freely opened.

In a case which had resisted the ordinary means, of cathartics, warm bath, opium, &c., for three days, M. Bouvier, of Paris, recently employed the inhalation of ether—etherization—with great benefit. On being *etherized*, the patient slept forty minutes, and awoke free from pain. He remained in this state for three hours, then slept for two hours more, and passed a good night. The pains did not return.

For the *paralysis* that succeeds to the poison of lead, should it persist after the use of the remedies before described, it has been recommended to employ stimulant liniments; but as successful a course as any is to place the arm in a splint, which is adapted to the inside of the forearm, and is kept *in situ* by a flannel bandage, the whole being suspended in a sling. In this manner, the flexors are kept at rest, and opportunity is afforded for the recuperative powers to restore the enfeebled action of the extensors. Electricity and galvanism, acupuncture and electropuncture, the cold and the hot douche, have also been advised, with blisters to the nape of the neck. Strychnia, however, offers greater probability of success, in these cases of partial paralysis, than any other remedy. Of forty cases in which it was administered by M. Tanquerel des Planches, all were either completely cured, or their symptoms greatly alleviated,—two months being the mean duration of the treatment. It may be administered in the dose of one-twelfth of a grain, in the first instance, two or three times a day, gradually increasing the dose until tetanic twitchings are experienced in the paralysed muscles, when it must be omitted until the twitchings have disappeared, and be again resumed.

℞.—Strychnia gr. ij.
Confect. rosæ ʒj.
Glycyrrhiz. pulv. ℈j. M.—et divide in pilulas xij.

It has been remarked, that the effects of strychnia are cumulative; in other words, that no perceptible effects may be induced for a time, and then they may explode with violence. The author has, however, administered it freely without having noticed these results. If strychnia be not at hand, nux vomica, especially the alcoholic extract, may be employed in its stead.

℞.—Extract. nuc. vomic. alcoholic. ℈j.
——— glycyrrhiz. ℈vij.—M. et fiant pil. lxxx.
Dose, two to six, two or three times a day.

Brucia has been given in similar cases, but it possesses no advantage over strychnia, except that its action is feebler, and consequently can be better regulated. Its strength compared with that of strychnia, has been variously estimated—as one to ten, one to twelve, and one to twenty-four.

Throughout the whole course of the disease, the diet should be bland, consisting chiefly of mucilaginous or farinaceous substances. After the disease has been removed, care must be taken to keep the bowels open, and gentle tonics may be administered, as the infusion of columbo, or of gentian,[a] or sulphate of quinia with sulphuric acid.[b] To prevent a recurrence of the disease, cleanliness is all-important in every occupation in which lead is handled; and the sulphuric acid lemonade has been esteemed a prophylactic in the laboratories of Paris. It has likewise been employed largely by Mr. Benson, the managing director of the British white lead works at Birmingham, in the form of "sulphuric beer," and with great success. It acts, he conceives, by converting the poisonous carbonate into the innocuous sulphate of lead. His formula for the preparation of the beer is as follows. Take of *molasses*, fifteen pounds; *bruised ginger*, half a pound; *water*, twelve gallons; *yeast*, one quart; *bicarbonate of soda*, one ounce and a half; *sulphuric acid*, an ounce and a half by weight. Boil the ginger in two gallons of water; add the molasses, and the remainder of the water hot. When nearly cold, transfer it to a cask, and add the yeast to cause fermentation. When this has nearly ceased, add sulphuric acid, previously diluted with eight times its quantity of water, and then the bicarbonate of soda, dissolved in a quart of water. Close up the cask, and in three or four days the beer will be fit for use. As acetous fermentation speedily takes place, especially in hot weather, new supplies are prepared as required. The object of adding the bicarbonate of soda is to give the liquor a pleasant briskness. The sulphuric acid, of course, remains greatly in excess.

[a] ℞.—Infus. colomb., seu
—— gentian. f℥xj.
Tinct. colomb., seu
—— gentian. comp. f℥j.—M.
The draught to be taken three times a day.

[b] ℞.—Quiniæ sulphat. gr. iv.
Acid. sulphur. dilut. gtt. xv.
Aquæ f℥vj.—M.
Dose, one-third, three times a day.

Workers in copper are liable to symptoms to which the name *colic from copper* (*colique de cuivre*) has been given; but the symptoms, both general and local, are those of inflammation of the lining membrane of the stomach and bowels, and the disease requires a treatment adapted for such a pathological condition. Generally, too, the *Colica Pictonum* (*C. Pictoniensis, Rhachialgia*, of some; Fr. *Colique de Poitou, Colique Végetale;* Ger. *Kolik von Poitou;*) as well as the endemic colic, which occurs in the West India Islands, (*Dry belly-ache*); that of Devonshire, (*Colica Damnoniorum, Devonshire colic;* Ger. *Cider Kolik, Devonshire Kolik*); and that of Madrid, (*Colica Madridensis, C. Hispaniensis*), have been described as varieties of lead colic. They certainly resemble it somewhat in their symptoms, but not so much as they do bilious colic. Evidence is wanting to

show that they are induced by the poison of lead :—in some cases, they unquestionably are, as when sugar of lead is added to cider, or the cider is kept in glazed vessels, whence results the Devonshire colic ; but at other times the disease occurs in cider districts, where every precaution is taken to prevent the contact of lead. In like manner, the *dry bellyache* of the West Indies was ascribed to the poison of lead contained in new rum, but closer examination has not proved this to be the fact. It is indeed, affirmed, that the disease is much more rare now than formerly, under the improvement of morals and clothing.

The treatment is essentially that of bilious colic.

VIII. TYMPANITES.

Synon. Tympanitis, Tympania, Tympanias, Tympanosis, Tympanita, Emphysema Abdominis, E. Tympanites, E. Tympaniticum, Meteorismus Pneumaticus seu Abdominis, Pneumatosis, Physema, Physesis, Hydrops Flatulentus seu Siccus, Affectio Tympanitica Abdominis, Cholera Sicca, Aero-enterectasia, Tympany, Meteorism ; *Fr.* Tympanite, Ballonnement, Pneumatose péritonéale ; *Ger.* Trommelsucht, Luftbauch, Bauchwindsucht.

Gases are always present in the intestinal canal, varying in their character, however, according to the part in which they are met with. Those that have been examined by MM. Magendie and Chevreul may be arranged in a tabular form, as follows :

Parts in the 100.

	Stomach.	Small Intestine.	Large Intestine.	
			Cæcum.	Rectum.
Oxygen . . .	11	0·	0·	0·
Carbonic Acid . .	14	24·39	12·50	42·86
Hydrogen . . .	3·55	55·53	7·50	----
Azote . . .	71·45	20·08	67·50	45·96
Carburetted Hydrogen .	----	----	12·50	11·18
	100·00	100·00	100·00	100·00

Diagnosis.—Allusion has already been made to the painful forms of colic, and gastralgia, which are owing to distension of any portion of the digestive tube by air pent up in it. In the affection, however, to which the name *tympanites* or *meteorism* is usually given, the air is commonly in the colon, in which it is more easy for a considerable accumulation to take place, than in any other portion of the canal, inasmuch as the valve of Bauhin is an obstacle to its ready diffusion upwards through the small intestines, whilst the arrangement of the sigmoid flexure, and the annulus at its termination in the rectum, prevent its escape downwards.

If the anatomical position of the colon be borne in mind, we can easily comprehend the symptoms of tympanites. There is great distension of the abdomen, especially in the course of the colon, which presses upon the diaphragm, and gives rise to dyspnœa. More or less pain is always experienced on taking a full breath, or by pressing on the abdomen, whether inflammation be coexistent or not ; and if the abdomen be percussed, there is the sonorousness as if a drum (*tympanum*) were struck, which has given the disease its name.

Causes.—There can be but little doubt, that the gases of the intes-

tinal canal may occasionally arise from the reaction of the elements of the food upon each other. Bubbles of gas have frequently been seen on dissection, escaping from the chymous mass, situate between the mouth of the ductus communis choledochus and the ileum, and it has been found experimentally, that when the mass, obtained from the small intestine, was suffered to ferment for some time in a stove, at the temperature of the body, the same gases were obtained as are met with in the small intestine. Still, this is not probably the general source of the meteorism we meet with. There is great reason to believe, that air may be secreted from the lining membrane of the canal, and in certain conditions of the system, more copiously than in others. According to M. Vogel, in the intestinal canal of swine, considerable accumulations of gas are sometimes met with between the layers forming the parietes of the bowels; and Sir Francis Smith has described an interesting case of the development of gas apparently by secretion. "On the 12th of May, 1840," he says, "I was consulted by a gentleman, who told me that he often suffered from an enormous development of gas in the stomach, which he discharged by eructation; that he likewise occasionally experienced a development of gas from the bladder, and that his skin acted in a similar manner, as he had observed in the bath. On the morning of the 15th, I found my patient in a bath, at 79° Fah. His breast, shoulders, abdomen, and hands were literally covered with minute bubbles of gas. On being questioned, the attendant at the bath stated that he had never previously witnessed anything of the kind. On removing the hands and arms from the water, the air bubbles disappeared, but gradually returned on again immersing those organs. The bubbles were of the size of a pin's head. On wiping them off, they disappeared, but gradually formed again."

Accumulation of gas in the intestines is one of the prominent symptoms of typhoid fever; it is also common in endo-enteritis and in nervous diseases, especially in hysteria and hypochondriasis.

There are certain articles of diet—as dried peas, beans, &c.—which give rise to the generation of much flatus, either by the reaction of their elements upon each other, or by the increased secretion of air which they occasion; and the effect of fresh clover upon the herbivora is well known to every agriculturist.

Treatment.—As the disease is connected with various pathological conditions, it is important to bear this in mind in the treatment. If the meteorism be dependent upon endo-enteritis, it must be treated by antiphlogistics; but, if the inflammation have passed away, and the lining membrane be left in an asthenic condition, excitants may be used with much advantage. One of the best of these, if not the very best, is the *oleum terebinthinæ*, which has, indeed, been regarded as a specific by some.[a] It may also be given associated with castor oil, (adde misturæ infra præscript. *ol. ricini.* ℥ss.), or in the way of enema.[b]

[a] ℞.—Ol. tereb. f℥ss.
Vitell. ovi
Aq. menthæ f℥iij.—Fiat mist.
Dose, one half, to be repeated, if necessary.

[b] ℞.—Theriac. commun.
Aquæ āā Oss.
Ol. tereb. f℥j.—M.

When the flatus is pent up in the large intestine, as is usually the case, instantaneous relief is often afforded by passing up a hollow bougie through the annulus of the rectum into the colon. The author had the satisfaction of preserving the valuable life of an aged individual, who had been long honourably engaged in the service of his country, by this simple method. Injection after injection had been employed ineffectually. An elastic-gum male catheter was then introduced; the flatus was immediately discharged, and the pain and tympanitic distension were at once removed. A similar case of meteorism has since fallen under his charge. The abdomen of the patient—a large woman—was constantly distended, and the abdomen tender, and markedly gaseous on percussion, especially in the region of the colon. Purgatives and stimulating enemata—of turpentine and assafœtida—were given without effect. She was cured by the introduction into the colon of a large flexible catheter, through which an immense quantity of fetid gas was discharged. A tight bandage was immediately afterwards applied round the abdomen, to prevent re-distension of the coats of the intestine, by affording them adequate pressure. The patient had no return of the symptoms.

When meteorism exists to a great degree, as in typhoid fever, it not unfrequently happens that cathartics act, and diarrhœa exists without any decrease of the gaseous distension;—a fact which would seem to show that solid matters may coast along the lining membrane of the intestines, and even be propelled forwards by the muscular movements of the canal, even when a sufficient degree of contractile power is not exerted on the air distending the intestine to diffuse it.

It is obvious, that in all cases the cause of tympanitic distension must be taken into account, and the disease be treated accordingly. It is only where there is a decided loss, or great irregularity, of nervous power, that stimulants can be advisable. In every instance, however, the dislodgment of the flatus, by means of the catheter, where this is practicable, will prove a palliative. It has been proposed to extract the air from the intestines, by means of an exhausting syringe—*clysma inversum*. A better plan would be to force air into the intestinal canal, and then suddenly withdraw it. The simple introduction of the elastic-gum tube, recommended above, will probably answer every purpose.

At times, the air, instead of being pent up in the intestinal canal, escapes, through a perforation in the intestine, into the cavity of the peritoneum, constituting the *aëropéritonie* of M. Piorry. The author has never met with such a case. Its existence has, indeed, been denied by some; and, if it ever occur, it is certainly rare. In such cases, it has been advised to tap the individual at the protruded umbilicus; but the difficulty of diagnosticating between tympanites of the intestine and tympanites of the peritoneum has discouraged operators. A great objection to the operation of puncturing through the abdominal parietes is the inconvenience of an artificial anus, which would result from an opening made into the intestine in the usual way. The most feasible course would be to puncture the cæcum in the place recommended under Obstruction of the Intestines (p. 160); and if an instrument no larger than the grooved exploring needle used in empyema, or the

minute trocar recommended by Dr. B. Babington in the same affection, were employed, no evil could easily result from an opening made into the intestine behind the peritoneum. A case has been recorded by M. Levrat, in which paracentesis of the abdomen was practised over the most salient point of the small intestine, in a case of tympanitic distension of the bowels. The operation was performed with a trocar of the size of a stocking needle, and afforded immediate relief. Fifteen days afterwards, the patient was engaged in his ordinary business.

Where the stomachs of cattle are distended with air, owing to articles of diet received into them, an opening is sometimes made directly into the organ; and it is said that many lives have been thus preserved.

IX. CANCER OF THE INTESTINES.

Synon. Induratio seu Scirrhus seu Cancer seu Carcinoma Intestinorum, Enterosarcomia, Enteropathia Cancerosa, Enteroscirrhus, Enterostenosis Scirrhosa seu Organica; *Fr.* Cancer des Intestins; *Ger.* Krebs der Gedärme, Darmkrebs.

Cancer may attack any part of the small intestines. It is more uncommon, however, in the upper portion; and, when seated in the duodenum, the evidences of it are similar to those of cancer of the pylorus. It is most common in the ileum.

a. *Cancer of the Small Intestine.*

Diagnosis.—The symptoms of cancer of the small intestine do not differ materially from those of chronic endo-enteritis. Pain is generally present, which may be dull, but more commonly is lancinating, especially some hours after eating, and when there has been time for the excrementitious portion of the aliment to reach the seat of the mischief. As the disease augments, the pain returns in paroxysms, accompanied by vomiting, and signs of obstruction of the bowels. When the cancer has proceeded to ulceration, the evacuations have a very offensive, and peculiarly repulsive, odour; and, if the abdomen be carefully examined, a hard tumour can, at times, be felt, which is painful on pressure, and whence shooting pains irradiate. If, along with these local signs, we have those of the cancerous diathesis, there cannot be much doubt as to the nature of the disease. Still, the diagnosis, in the absence of certain of these signs, is obscure, especially at the commencement.

The disease may terminate fatally, owing to the obstruction it induces to the passage of the excrement; or it may cause inflammation of the mucous or peritoneal coat, under which the patient may succumb; or lastly, he may die under the protracted irritation, which the disease, like all cancerous diseases, sooner or later developes.

Causes, and Pathological Characters.—These do not differ from those of cancer of the stomach.

Treatment.—This must repose upon the same principles as that of cancer of the stomach. It is here still more requisite to avoid agents that may induce constipation. The pain, however, is so severe as to demand the employment of narcotics, and if it cannot be relieved by hyoscyamus, belladonna, stramonium or lactucarium, opium ought to

be had recourse to. It may be combined, in such case, with any of the gentle laxatives, as rhubarb.[a] Laxatives, as well as laxative enemata, are, indeed, needed throughout the disease. Opium may also be administered by the rectum; or the salts of morphia may be used endermically.

[a] R.—Opii pulv. gr. ij.
Rhei pulv. gr. vj.—M. et divide in pil. ij.
To be taken for a dose.

It has been advised to establish an issue over the stomach, but no permanent good effect can be expected from it. Should it be inserted, the salts of morphia may be made to exert their influence on the system through it.

It is scarcely necessary to say, that the diet should be of such a character as to furnish little excrementitious matter, and that of an unirritating kind; and that care should be taken to avoid excesses in quantity. A small portion of easily digested animal food; or preparations of milk, with the farinaceous articles, arrowroot, sago, or tapioca, will suggest themselves; whilst the succulent vegetables that afford but a small quantity of nutritious, and a large proportion of excrementitious, matter, should be carefully avoided.

b. *Cancer of the Large Intestine.*

Diagnosis.—The symptoms of cancer of the colon are essentially those of cancer of the small intestine, except that, in many cases, a circumscribed, hard, fixed, and generally adherent tumour is perceptible in the course of the intestine, the pain of which is lancinating, and increased by pressure; and along with these local phenomena, there is the usual straw, or livid colour of the skin.

On dissection, the same appearances are met with as when the disease affects the small intestines.

When cancer attacks the rectum, and has made slight progress only, the differential diagnosis is not easy; the sense of weight in the loins and rectum; the straining and ineffectual efforts at defecation; the discharge of more or less thin and bloody fluid; the pains excited by the evacuations during their passage, especially when they are consistent, may be a part or parts of many diseases of the rectum,—as hemorrhoids, fissures, &c. &c. When the disease is more advanced, however, other signs become added. The calibre of the intestine is so much diminished, that the fæces can be only extruded with great difficulty; and if they have any consistence, they assume the shape of the aperture through which they pass; at times, being not larger than the figured excrements of the infant, and even smaller; and at others, assuming a riband shape, in correspondence with the configuration of the constricted part of the intestine. When an examination is made with the finger, it is found that it cannot be passed into the rectum: either a ring is found to project into the intestine, or the mucous membrane feels indurated, or full of irregular protuberances.

As the disease proceeds in its course, almost insupportable lancinating pain is experienced, which may extend to the sacrum and loins, and to the nates and thighs, and is greatly augmented when the

patient is in the erect attitude, or when he walks or rides. When the scirrhus goes into the ulcerated state, the evacuations may be passed with more facility; but the discharge of a sanious, bloody, and extremely fetid fluid sufficiently indicates, that this change is not an amelioration. On the contrary, the pains become, if possible, more insupportable; the digestion is greatly disturbed; gas is secreted in large quantities; and the evacuations are sparing and fetid: vomiting of fecal matters, indicating total obstruction, supervenes, and the individual dies, either from this cause, or worn out by constant irritation.

The termination and the symptoms indicating it belong not to cancer of the rectum only, but to the same disease when affecting the colon or any portion of the digestive tube.

At times, the disease does not commence with scirrhous induration, but with ulceration of the mucous membrane; its progress is then more rapid.

Causes and Pathological Characters.—These are essentially the same as those of cancer of the stomach and small intestines. The disease may affect any part of the rectum, but it is usually situate an inch or two above the margin of the anus.

Treatment.—The disease is irremediable, except when seated very low down in the intestine, when it may, in certain cases, be extirpated by a surgical operation. Generally, as in other cases of cancer of the digestive tube, the efforts of the practitioner must be limited to palliatives, as opium, or some of its preparations, administered either by the mouth or anus; and where the intestinal obstruction becomes complete, it may be advisable to establish an artificial anus, as recommended under another head.

Occasionally a stricture, which is in no respect malignant, forms in the colon, and about its sigmoid flexure especially, as a consequence of hypertrophy of the submucous cellular tissue, induced by chronic dysentery. The author has met with two or three cases, which supervened on malignant cholera, and existed for years. The symptoms are those of narrowness, as produced by scirrhus or cancer, and the treatment required is much the same. All that can be effected is by the use of the bougie, when it can be made to reach the seat of the stricture.

Spasmodic stricture of the rectum—Strictura intestini recti spasmodica, Obstructio recti spastica,—occasionally occurs, and may be readily mistaken for the permanent form. The patient equally suffers from constipation and extreme difficulty in passing the evacuations, and the excrement indicates the form of the constricted portion. The disease occurs in those of a nervous habit, and especially such as are liable to hysteria, hypochondriasis and dyspepsia, and the phenomena may continue for years, without improvement, or with short intervals of amendment, and then subside spontaneously.

The *treatment* of these cases consists in preventing irritation from the feculent matter by keeping the bowels soluble; yet it is important to avoid irritating them by repeated cathartics. The diet should be light, and such as may afford an unirritating excrement; and anodynes

may be required, both administered by the mouth and in the form of enemata and suppositories. The cold hip-bath, and cold affusion over the loins, may likewise be serviceable as tonic as well as revellent agents. Under a treatment of this kind, maintained for a length of time, the spasmodic stricture may be gradually resolved; but, in many cases, it terminates in stricture of the permanent form, which may require the appropriate mechanical treatment already referred to.

X. HEMORRHAGE INTO THE INTESTINES.

Synon. Hæmorrhagia Intestinorum, Enterorrhagia, Enterohæmorrhagia, Melæna, Hæmatochezia; *Fr.* Hemorrrhagie des Intestins, Écoulement de sang par l'Intestin; *Ger.* Blutfluss aus den Därmen, Blutfluss aus den Gedärmen, Darmblutung, Darmblutfluss.

Hemorrhage from the intestines occurs under the same circumstances as hæmatemesis. It may arise from diseases, which affect the vessels of the mucous membrane, as cancer, or ordinary ulceration of the follicles; or it may be produced by causes, which determine hyperæmia of the vessels of the intestines, and consequent transudation. When it occurs in long-protracted fevers, especially of the typhoid kind, which are accompanied by follicular ulceration, or in those of the typhus form, in which there is a morbid condition of the blood, as well as diminished cohesion of the solids, it may prove fatal in a short space of time. In other cases, in which the discharge is simply owing to hyperæmia of the intestinal vessels, as is apt to be the case in continued fever, the loss of a moderate quantity of blood, in this way, may afford relief; but, in all cases, the pathological causes in which it originates must be carefully investigated, and, if possible, removed.

Dr. Chapman, of Philadelphia, refers to the case of an aged gentleman affected with jaundice, who, in twenty-four hours, evacuated probably three or four gallons of a dark grumous fluid, and expired with it flowing from his bowels; and to another case of a young lady, who, in previously good health, was awakened out of her sleep by a discharge of blood from the bowels so profuse, that, on his arrival, he found the bed filled with it. It continued in this way for the greater part of the night, until a prodigious quantity was discharged. On the next day it ceased, and she recovered.

Treatment.—The general principles are the same as in hæmatemesis.

A variety of melæna would seem to be produced by morbid secretion from the mucous follicles; and of this nature are, doubtless, the black discharges, which the author has repeatedly seen, where the lining membrane of the intestines has been long irritated under the use of mercurial and other cathartics.

XI. HEMORRHOIDS.

Synon. Hæmorrhoides, Morbus Hæmorrhoidalis, Fluxus Hæmorrhoidalis, Hæmorrhoisis, Hæmorrhois, Hæmorrhagia Intestini Recti, Proctica Marisca, Marisca, Proctalgia Hæmorrhoidalis, Piles; *Fr.* Hémorrhoïdes; *Ger.* Hämorrhoiden, Hämorrhoidalkrankheit, goldene Ader, Goldaderfluss, Goldaderkrankheit.

By the older writers the term hæmorrhois (αἱμορροις), which literally means "flux of blood," was generally employed with that signification,

or for menstruation, and especially profuse menstruation, but never, according to Dr. Good, in the sense in which it is now used;—that is, of *hemorrhage from the anus.* It is not, however, confined to such hemorrhage, but has been extended so as to include certain tumours that are seated in, or connected with the rectum.

Diagnosis.—Most of the writers of continental Europe speak of a special condition of the system, which gives rise to hemorrhoidal discharges. This they term the hemorrhoidal diathesis, or impulse,—*Diathesis hæmorrhoïdalis, Motus hæmorrhoïdalis, Molimina hæmorrhoïdalia;* Ger. *Hämorrhoidaltriebe, Hämorrhoidalanlage, Hämorrhoidalbeschwerden.* It is frequently announced by signs denoting a concentration of the vital activity inwards,—as chilliness; cold extremities; heat and pain in the rectum or anus, and sense of weight in the loins, often accompanied by symptoms of gastric, cerebral, and, indeed, general disorder. After these premonitions have continued for a time, blood is discharged, sometimes copiously, at others, only at intervals. Occasionally, especially in the first of these cases, it is of a more or less florid colour, and is liquid, seeming to be a true sanguineous exhalation from the mucous membrane; at other times, when discharged at intervals, the blood is retained in the rectum, and is dark-coloured and grumous. The quantity exhaled may be such as to destroy life suddenly; but this is not common; it more frequently continues for a longer or shorter period, so as to gradually exhaust the system. Dr. Chapman states, that he attended a case with Dr. Physick, the subject of which, according to his own statement, must have lost, on an average, half a pint of pure blood daily for eighteen months, and on several occasions the amount could not have been less than two quarts.

Not unfrequently, the hemorrhage recurs periodically, and becomes the result of associated actions, so that it cannot be arrested with impunity.

This hemorrhage or *hemorrhoidal flux—Fluxus hæmorrhoïdalis, Hæmorrhagia proctica*—may be, as before remarked, a mere exhalation from the mucous membrane; but, in other cases, it takes place from the rupture of those tumours to which the name *Hemorrhoids* or *Piles* has been appropriated by the moderns. Their supervention is often indicated by the same symptoms that characterize the *Diathesis hæmorrhoïdalis.* These tumours may be *external* or *internal.* The *external* form at the margin of the anus, sometimes in great number; at others, not more than one. They are commonly of the size of a pea, but occasionally attain that of a walnut, and have been met with, in females of advanced age, of the size of the fist. They are generally round; but, occasionally, of irregular shape, smooth, and elastic. Their colour is red, brown, or blue; and they are hot and painful,—the pain being lancinating and pulsatory. Internal hemorrhoids are placed within the verge of the anus, so that they can only be seen when the patient forces down, or be felt by an examination. When they are attended with a discharge of blood, they are termed *Open piles, Bleeding piles, Hæmorrhoïs cruenta, Proctica marisca cruenta, Hämorrhoïdes fluentes, Proctorrhœa;* Ger. *Mastdarmblutung.* In the opposite case, they are called *Blind Piles, Hæmorrhoïs cæca, Proctica marisca cæca;* Ger. *Blinde Hämorrhoiden.*

During the first days of the disease, especially when the patient retains the erect posture, the hemorrhoids are tense, and the pain is severe and pulsatory, exciting great uneasiness at times,—so much so, as to render the sitting posture impracticable. Gradually, however, in the generality of cases, either spontaneously or through the exertions of art, they subside, become rugous, pale, and disappear. The pain during defecation is especially great, unless care is taken, that the fæces are of such consistence as not to induce irritation. Generally, hemorrhoids terminate by resolution, leaving perhaps a greater tendency to the same morbid condition. Occasionally, however, they remain troublesome, so as to require the attention of the surgeon for their removal. At times, too, if neglected and irritated, the inflammation extends to the surrounding parts, and fistula, or other disease of the rectum, may be the consequence.

Causes.—It has been presumed, that hereditary conformation may predispose to the hemorrhoidal diathesis. Unquestionably, period of life has an influence. The disease is rare in young persons, and is most common between thirty and fifty years of age. It can readily be understood, too, that whatever interferes with the due circulation of the blood through the abdominal venous system,—as liver disease, pregnancy, a sedentary life, or long-continued exercise with the body erect,—may predispose to every form of hemorrhoids. The immediate exciting causes are commonly local;—such as obstinate constipation, with indurated fæces, which exert injurious pressure on the rectum in defecation; and the abuse of purgatives, enemata or suppositories.

Pathological Characters.—The old opinion was, that hemorrhoidal tumours are merely dilated hemorrhoidal veins (*Varices hæmorrhoidales*). Such, indeed, is the opinion of MM. Bérard, Raige-Delorme, and Grisolle;—and sometimes they unquestionably are so. Attentive pathological investigation would seem, however, to show, that they are, at times, constituted of a truly erectile tissue. At other times, again, and in the opinion of many observers, they are, most frequently of all, constituted by an effusion of blood into the hypertrophied submucous cellular tissue of the rectum. These last have been considered the true hemorrhoidal tumours—*mariscæ*—those of a larger size being thus formed, whilst the smaller may be mere varices.

Treatment.—The treatment of the hemorrhoidal flux rests upon the same principles as that of hemorrhage from the intestines in general. The seat of the transudation can, however, in this case, be easily reached, if we are desirous of causing our hæmastatics to come into immediate contact with it. In all cases, inquiry must be made as to the pathological conditions that accompany the hemorrhage; and it is not until this becomes dangerous from its quantity, that topical applications are much needed: in such cases, cold, and the most efficacious of the mineral and vegetable astringents may be prescribed;—care being taken, that they are not used of such strength as to condense and corrugate the parts so much as to endanger the supervention of inflammation. The iodide of iron[a] and creasote[b] form valuable hæmastatic injections.

[a] R.—Ferri iodid. ʒi.
Aquæ Oj.—M.

[b] R.—Creasot. fʒss.
Aquæ Oss.

When the discharge of blood is very copious, the rectum must be examined carefully, in order, if possible, to ascertain the spot whence the hemorrhage proceeds. In such cases, powdered alum, or tincture of creasote,[a] or the tampon, or caustic, or even the actual cautery, may be demanded. The case then becomes one of surgery.

[a] R.—Creasot. p. i.
Alcohol. p. viij.—M.

The sudden suppression of the hemorrhoidal discharge, or its non-recurrence at accustomed periods, has been regarded as the cause of many diseases; and there cannot be a question, that the agency may be occasionally morbific, but not so frequently as is generally believed. When the person anticipates its recurrence, he should avoid much exercise or sitting in the erect posture; the diet should be light and laxative,—consisting of stewed prunes and other fruits; and, in every form of hemorrhoids, the seats, which the patient uses, should be stuffed. In the violent inflammatory and painful condition of external hemorrhoids, relief is obtained by the application of leeches immediately over the tumour—if practicable; if not, around the margin of the anus. The patient may, likewise, sit over hot water; apply warm fomentations and emollient cataplasms, and use injections of the same kind. In many cases, sitting in cold water has been an effectual remedy. The *sitzbath* is a favourite remedy with the hydropathists. At the same time, the bowels must be kept well regulated by the mildest cathartics—as sulphur, magnesia, or castor oil—or by the use of mild mucilaginous injections, of which a decoction of flaxseed, or the infusion of slippery elm, is as good as any. Before the patient is about to have an evacuation, it may be well to throw up one of these injections, or a small quantity of bland oil.

Difficulty is sometimes experienced in returning protruded hemorrhoids. Pressure alone will not accomplish it; but if the patient be directed to make a forcible expulsive effort, and pressure be made simultaneously, the tumour frequently recedes immediately; the sphincter is relaxed; the ligature, which it forms around the tumour, is removed, and the reduction is easy.

At times, the local inflammatory symptoms are so violent as to implicate the whole system, and require general bloodletting, but this is not common. Occasionally, too, a hemorrhoid, whose base is within the anus, passes through during the efforts at defecation, and excites great suffering, which can only be relieved by returning it to its place.

From the first, but especially after the first few days, an ointment of powdered galls and opium, or of nitrate of silver, applied by the end of the finger, where this can be done, affords great relief.[a] Fomentations and poultices of *datura stramonium*, and ointments composed of this and other narcotics, have likewise been employed. When the tumours remain torpid, more active astringents than the *unguentum gallæ* are of use.[b]

[a] R.—Gallar. pulv. ℥j.
Opii pulv. ℈ss.
Adipis ℥ss.—M.
R.—Argent. nitrat. in pulv. ten. gr. v.
—x.
Adipis ℥j.—M.

[b] R.—Alumin. ℥j.
Adipis ℥ij, or,
R.—Ung. plumbi acet. ℥ss.
Alumin. ℥ij.
Opii ℥ss.—M.

Recently, an ointment of matico has been recommended in the same cases, and Mr. Edward Young affirms, that when made according to the following form, and applied night and morning, it is unsurpassed in efficacy.

R.—Piper. angustifol. pulv. ʒiij.
Opii pulv. gr. iij.
Adipis ʒj.—M.

When the hemorrhoids make their exit through the anus and become strangulated, and none of the ordinary methods of management succeed in discussing them, the case becomes surgical, and the hemorrhoid has usually to be removed either by ligature or excision. A dangerous sequel to the latter operation is profuse hemorrhage, under which patients have sunk in spite of every exertion on the part of the practitioner. "Whatever," says M. Grisolle, "be the method adopted, the operation is always one of the most serious character, and has already made numerous victims."

If pressure should not succeed in arresting the hemorrhage, the only resource is the actual cautery.

In the form of hemorrhoids to which the term *vascular tumour* has been applied, and which Dr. Houston, of Dublin, regards as an affection of the mucous membrane and submucous tissue exclusively, having, usually, he believes, for its base a knuckle or bunch of varicose veins, or else as being a distinct and independent growth, the result of some other irritation in that region, but giving rise ultimately to the formation of a varicose condition of the diseased part, that gentleman has recently found great benefit from the application of nitric acid, of the specific gravity of 1·500. He directs the patient to strain, as when on the night chair, so as to bring the tumours fully into view; and whilst they are down, he lets him either lean over the back of a chair, or lie down, in the bent posture, on the side on which the disease exists, with the nates over the edge of the bed. When the patient is thus placed, a piece of wood, cut into the shape of a dressing-case spatula, is dipped in the acid, and then, with as much of the acid adhering to it as it will carry without dripping, it is rubbed on the tumour to the extent desired, —its effects being exhibited by the colour of the part being changed to a grayish white. One or more applications of the acid are needed, according to the depth of the slough required, after which the whole is smeared with olive oil, which destroys the farther escharotic action. The prolapsed parts are then pushed back within the sphincter, the patient is put to bed, and an opiate administered. The pain is at first sharp and burning, but it goes off in two or three hours, and does not return in the same form. A general uneasiness about the anus, on motion, together with a slight sense of heat, fulness, and throbbing, are felt for a few days, and there may be some feverishness; but the symptoms following the application are usually so mild as not absolutely to require confinement to bed for more than a few hours, although such confinement may often be desirable. On the third or fourth day, Dr. Houston prescribes a cathartic draught, which is found to act generally without either pain or prolapsus of the rectum. After this the improvement is rapid, and free from any dangerous accompaniments.

It must be borne in mind, however, that the only case in which the nitric acid seemed to him capable of serving a good purpose was the internal bleeding pile; the soft, red, strawberry-like elevation of the mucous membrane, to which he gives the name *vascular tumour*, and which the acid removes by the production of a slough of its surface. On this Dr. Houston especially insists.

XII. PROLAPSUS ANI.

Synon. Proctocele, Proctica Exania, Procidentia Ani, Exania, Prolapsus Intestini Recti, Archoptosis, Proctoptosis, Sedes Procidua, Falling down of the Fundament, Prolapsion of the Anus, Coming down of the Body; *Fr.* Prolapsus de l'Anus, Chute du Rectum, C. du Fondement, Renversement du Rectum; *Ger.* Vorfall des Mastdarms, V. des Afters.

Two divisions of prolapsus ani have been made; the one consisting of prolapsus of the rectum, *Prolapsus totius recti, Procidentia recti;* the other being a prolapsus of the lining membrane alone,—*Prolapsus membranæ mucosæ recti*, the *Anatrophe recti* of Swediaur. The names sufficiently indicate the character of the two affections. In both, the protruded portions are closely embraced by the sphincter, which interferes with the return of the blood, and excites considerable pain. In cases in which the prolapsus is very considerable—six to ten inches in length, for example,—it is presumable, that there is an invagination of the sigmoid flexure of the colon. Such cases have been recorded by Morgagni and Langstaff.

Diagnosis.—The slightest degree of prolapsus of the mucous membrane of the rectum is indicated by a sense of bearing down and smarting, especially when the fæces are evacuated, and still more when they are of too great consistence. As soon, however, as the rectum has been emptied, the protruded portion either returns of itself, or with very slight pressure made by the patient or nurse. If the affection be neglected, the protrusion becomes greater and greater, and ultimately is not easily replaced, unless when the patient is in the horizontal posture, and then it remains only momentarily. The intestine being constantly exposed to the air, and to friction from clothes and sitting, becomes inflamed and ulcerated; the epithelium of the mucous membrane is converted into cuticle; and in bad cases, is fungous, indurated, and varicose, exhaling blood and an offensive sanies. It now becomes impossible to replace the gut; the health suffers; digestion is impaired, and the patient may sink, worn out by hectic. This is fortunately a rare termination, and ought never to supervene, if ordinary attention were paid in the earlier periods. In all cases, the pain is increased during defecation, and when the person is in the erect attitude: the mucous membrane is of a dark red, sometimes almost black colour.

Causes.—Age affords a predisposition; the affection being seen most commonly in infancy and advanced life, in consequence of the atony of the muscular and other tissues. The exciting causes are—hardened fæces; great straining; the abuse of emollient and other glysters, suppositories, or purgatives; long-protracted diarrhœa, or dysentery; hemorrhoids; worms; laborious parturition; diseases of the urinary organs, &c.

Treatment.—In accidental cases of prolapsus, the intestine is gene-

rally reduced with facility. The child, if the disease occur in infancy, being placed on the back, gentle pressure must be applied to the protruded intestine, with the thumbs of the nurse previously dipped in oil, or, what is better, it may be laid on its face, the thighs separated, and the nates pressed together. But should these means fail, the forefinger, previously oiled or greased, may be introduced into the gut, in order to remove the stricture from the sphincter. This is certainly a more safe and speedy plan than the application of astringent substances to the protruded parts, which may irritate and inflame them.

Where the procidentia in infants is kept up by worms, diarrhœa, &c., these affections must be removed, and whilst a tendency to protrusion remains, the bowels should be kept open by the mildest laxatives, or by clysters. All irritation of the bowels should be guarded against, and the nates be dipped twice a day or oftener in cold water. As the child grows older, the affection usually passes away; but should it persist for a great length of time, or the portion which escapes be very considerable, astringent injections and fomentations should be had recourse to, such as a decoction of oak bark,[a] or alum,[b] or the two combined.[c]

[a] R.—Quercûs cort. ℥ss.
Aquæ Oij.
Coque ad Oj.

[b] R.—Alumin. ℥j.
Aquæ f℥vj.—M.

[c] R.—Querc. cort. ℥j.
Aquæ Oiss.
Coque ad Oj. et cola: tum adde
Alumin. ℥ss.—M.

If the procidentia have been down for some time, and the swelling and inflammation are considerable, it may be necessary to apply cold lotions, and to surround the prolapsed part with a cloth, making gentle pressure upon it so as to reduce its size, after which it can generally be returned. If much inflammation exist, leeches may be needed. When young children have been for a long time subject to the protrusion, it has been advised that they should be made to sit upon a hard flat stool, or in a chair without arms, and so high that they cannot touch the ground with their feet. When they are so old, however, as to walk about, the T bandage, supported by a bandage over the shoulders in the form of braces, may be applied, with or without the aid of cold lotions, as may be esteemed advisable. Recently, Dr. Hake has stated, that he found the following method successful in curing prolapsus. He returns the bowel or hemorrhoidal tumours with great care after each evacuation, assisting its return by means of soap-lather; he then applies a coil of moist sponge firmly on the anus, and whilst retaining it there with one hand, he brings the nates together by means of a broad strip of adhesive plaster, as in approximating the edges of a wound.

Should all the usual means fail in curing the prolapsus—which is not a common occurrence—the case has to be transferred to the surgeon, who may consider it advisable to remove some of the projecting folds of the skin, which converge at the margin of the anus.

In the cases of prolapsus that are produced by invagination of the intestine—which may be known by their great length, as well as by

the practicability of carrying the index finger very high up in the cylindrical groove situate between the invaginated portion and the rectum, whilst in procidentia of the mucous membrane, the finger is arrested by a *cul-de-sac* at the part where the relaxed mucous membrane is detached from the muscular coat—but little can be done, and the prognosis ought always to be unfavourable. In rare cases, however, the invaginated portion has been discharged *per anum*.

XIII. CONCRETIONS IN THE INTESTINES.

Synon. Concretiones alvinæ, Enterolithi; *Fr.* Calculs des Intestins, C. intestinaux, Pierres Stercorales, Concrétions intestinales; *Ger.* Darmsteine.

Concretions of various kinds are met with in the intestinal canal. The scybala, to which reference has been made so often, have indeed been classed amongst them by Dr. Good, under the name *Enterolithus scybalum*. These, as has been shown, must be regarded as essentially constituted of indurated fæces.

Diagnosis.—The signs, that denote the presence of concretions of any kind in the digestive tube, are equivocal, and must, of course, vary according to the situations, size and number of the concretions. These are rarely seen in the stomach, except in the herbivorous animal, where they have been frequently met with. Cases have occurred in which they have been vomited from the human stomach.

When the concretions are seated in the intestinal canal, the symptoms are at times those of obstruction, and at others, of irritation of the lining membrane, as indicated by constant diarrhœa and tormina. Sooner or later, a hard circumscribed tumour may be felt in some part of the intestinal tract, to which pain, especially on pressure, is referred. This tumour is commonly immovable, but may change its position somewhat as the position of the body is varied. Most frequently, it is referable to some part of the colon, and especially to the cæcum, where it may give rise to inflammation of that intestine. At other times, the concretion becomes impacted in the appendix vermiformis cæci, exciting inflammation in that appendage; and, wherever situate, if it be not got rid of, the irritation, induced by its presence, may gradually wear out the patient.

When the seat of the extraneous body—if it may be so termed—is the rectum, a sensation of disagreeable weight is referred to that intestine with constant efforts to evacuate it, and not uncommonly the patient suffers from hemorrhoids, vesical irritation, and inflammation of the rectum. Defecation is difficult, and but little relieved by cathartics; and enemata cannot be thrown up in any quantity. These symptoms lead to an exploration of the intestine, when the precise nature of the affection is appreciated.

As the concretion is gradually formed, the symptoms, induced by it, generally supervene gradually. The terminations may be various. It may be evacuated by vomiting, by the bowels, or by adhesion of the intestine to the peritoneum and suppuration through the parietes of the abdomen, in all which cases the event may be favourable. It may eventuate also unfavourably, by inducing fatal inflammation or gangrene of the intestine and peritoneum, or rupture of the intestine.

The concretion is generally free in the canal, but in rare cases it is adherent. The part of the tube, in which it is seated, is usually enlarged, and thickened, and the dilatation forms a kind of sac in which the stone is contained.

Character of the concretions.—The number of concretions met with has varied:—in the stomach, as many as from ten to one hundred and more have been found. The size and weight have been equally various—from a few lines to some inches, and from a grain to some pounds. They are generally roundish, oval, or spherical; at times, however, long, cylindrical, plano-convex, or flat; and, when several of them exist together, their triangular surfaces exhibit that they have been pressed against each other. At times, they have the shape of the colon. The larger the calculus, the more irregular, in general, is its form; and, not unfrequently, it is constituted by the aggregation of several smaller concretions.

Most of the intestinal concretions, both of man and animals, have a nucleus, which may be so intimately associated with the matters deposited upon it, as not to be distinguished. The concretions, that are formed entirely of magnesia, have none. In man, the nucleus has been a cherry or plumstone; a salivary or biliary calculus; a small piece of bone; a needle; an eggshell; sand or gravel; a splinter of wood; a calcareous substance, &c., &c.

In their chemical characters, the intestinal concretions in man may be divided into, 1, those in which the inorganic, and, 2, those in which the organic constituents prevail. In the *former*, phosphate of lime is the main component. The following constituents were found in one: phosphate of lime, 45·34; ammoniaco-magnesian phosphate, 5·16; animal matter, 25·20; vegetable fibres, 20·30; resin, 3·90;—and in another, found in the colon, and of which a plumstone was the nucleus, the following were the constituents:—phosphate of lime, 45·34; ammoniaco-magnesian phosphate, 5·16; lime, (carbonate?) 25·20; sulphuric and chlorohydric acids, traces; resin, 3·90; wood fibres, 20·30, and animal matter. Other concretions have been found to consist, chiefly, of magnesia, which had accumulated under long-protracted use of the article. In those in which the organic matters predominate, fat and cholesterin are the principal constituents, united with phosphate of lime; the fat is probably a secretion from the mucous membrane, and the cholesterin we know to be the animal principle of biliary calculi.

The great difference between the calculi found in the intestines of man and animals appears to be, that in the former the phosphate of lime is the chief constituent, whilst in the latter it is the ammoniaco-magnesian phosphate. In both, vegetable or animal substances most commonly form the nucleus, and animal mucus is the binding material.

Treatment.—As the diagnosis of the existence of these concretions is extremely difficult, it is not easy to lay down any precise plan of treatment. Frequently, they remain long in the intestines without causing any mischief, but, at other times, they induce enteritis, or

cause obstruction of the bowels and its sequelæ. These have already been pointed out, along with the appropriate management.

When the concretion is in the rectum, it may be extracted by the polypus or calculus forceps, or by the handle or mouth of a table-spoon, or by a scoop or marrow-spoon: it may be necessary, first of all, to break it down.

It has been advised, that the operation of *laparo-enterotomy*, or of opening the parietes of the abdomen and the intestines, so as to remove the stone, should be practised; but such an operation can scarcely be admissible.

XIV. WORMS IN THE INTESTINES.

Synon. Helminthia Alvi, Vermes Intestinales, Enthelmintha, Splanchnelmintha, Helmintha, Entozoa, Endozoa, Entozoaria, Parasitic Worms, Intestinal Worms; *Fr.* Vers Intestinaux, Entozoaires du Tube Digestif; *Ger.* Intestinalwürmer, Eingeweidewürmer.

All animals and vegetables, and every part of them, are liable to be infested by parasites; but those only that are seated in the intestines are the cause of much uneasiness to man. In some animals, their presence elsewhere is the cause of much mischief. They have been found in the lungs, kidneys, and urinary passages; liver and biliary passages; brain, skin, cellular tissue, muscles, blood, the aqueous humour of the eye, the cornea, &c., of animals. Where they are present in great numbers or size, in the intestinal canal, it is owing to a particular condition, which has been termed *Invermination* or *Worm Disease*, *Helminthiasis*, *Scoleciasis*, *Morbus verminosus*, *Status verminosus*, *Saburra verminosa*, *Vermitio*, *Verminatio*, *Parasitismus intestinalis*; Fr. *Helminthiase*; Ger. *Würmkrankheit*, *Wurmsucht*, *Entozoënbildung*.

The following table exhibits the parasites which have been met with in the human body, and their usual habitat.

ENTOZOA.	WHERE FOUND.
Trichocephalus dispar.	In the Intestines.
Oxyuris vermicularis,	
Ascaris lumbricoides,	
Bothriocephalus latus,	
Tænia solium,	
Ditrachyceras rudis.	
Diplosoma crenata,	In the Urinary Bladder.
Spiroptera hominis,	
Dactylius aculeatus,	
Distoma hepaticum,	" Gall Bladder.
Distoma lanceolatum,	" do.
Distoma oculi humani,	" Eye.
Strongylus gigas,	" Kidney.
Filaria oculi,	" Eye.
Acephalocystis endogena,	" Liver.
Echinococcus hominis,	" Liver, Spleen and Omentum.
Polystoma pinguicola,	" Ovary.
Polystoma venarum,	" Veins.
Monostoma lentis,	" Crystalline Lens.
Filaria bronchialis,	" Bronchial glands.
Trichina spiralis,	" Muscles.
Cysticercus cellulosæ,	
Acephalocystis multifida,	" Brain.
Filaria medinensis,	" Cellular texture.

The worms that infest the intestimal canal are not numerous. They are,

1. *Trichocephalus dispar*, *Trichuris*, or *long threadworm;* Fr. *Trichocéphale;* Ger. *Peitschenwurm*, *Haarkopf*, which is a round, white worm, from an inch and a half to two inches long, and generally inhabits the large intestines, especially the cæcum—being rarely seen in the small intestines. More than one thousand, according to Rudolphi, have been found in the intestines of a female. Dr. Bellingham affirms, that it is very common in Ireland, or at least in Dublin.

2. *Oxyuris vermicularis*, *Ascaris vermicularis*, *Helminthion*, *Maw* or *Thread worm;* Fr. *Ascaride*, *A. vermiculaire*, *Oxyure vermiculaire;* Ger. *Pfriemenschwanz*, *Springwurm*, *Madenwurm*, *Askaride*, is commonly found in the rectum, but is migratory. It is usually met with in children, but not unfrequently in adults. *Ascarides*—as they are generally termed—are frequently found gregarious in the intestinal canal, in the form of a ball, and, occasionally, so covered with mucus as not to be easily accessible to the action of anthelmintics. At times, they migrate from the intestines, and lodge in the parts of generation of the female, or in the urethra, exciting irritation and a kind of leucorrhœa. Many of these worms, it is affirmed, have been found in the intestines of a new-born child. Cysts, filled with them, have, likewise, been discovered between the membranes of the stomach and œsophagus.

3. *Ascaris lumbricoides*, *Helmins*, *Lumbricus teres hominis*, *Ascaris gigas hominis* or *long round worm;* Fr. *Lombricoïde*, *Ascaride lombricoïde*, *Lombric;* Ger. *Spulwurm*, is most commonly met with in the intestinal canal, especially in the small intestines. It has been found, however, in the ductus pancreaticus, the ductus communis choledochus, and gall-bladder; and is, at times, voided by the mouth. Sometimes, the intestinal tube is almost filled with them, and they are occasionally congregated in the form of a ball. In an inaugural dissertation, presented before the Faculty of Jefferson Medical College of Philadelphia, in the spring of 1846, Dr. James L. Ord, of Michigan, stated, that he himself, when about five years of age, after the use of anthelmintics, spigelia marilandica and oleum chenopodii, discharged as many as two hundred and seventeen at one time; and, in a short period, five hundred and forty. As many as eighty have been voided in a case of fever. When dead, this worm is quite stiff. It is usually from three to twelve inches in length, and from a line and a half to two lines in diameter. The colour varies according to that of the aliment—being frequently of a milky or brownish-ash—rarely of a blood-red.

A new species of ascaris has lately been found, and called by Dr. Bellingham, *Ascaris alata.* It is about three and a half inches long; the greatest diameter, posteriorly, three quarters of a line; the shortest diameter, anteriorly, half a line. The body is cylindrical, of a dirty-yellowish colour, marked with the four longitudinal lines, and with the transverse very close striæ. that are found in the other species. The ascaris alata is very distinct from the ascaris lumbricoides of the

human subject. In general appearance, it is not unlike the *ascaris mystax*, which inhabits the stomach and small intestines of the cat.

4. *Strongylus gigas* (*F*) *Strongle géant*, is rarely found in the intestines. It is met with five inches, a foot, a foot and a half, and even three feet long, and from two lines to half an inch in diameter. Those that are found alive, especially in the kidneys, are of a blood-red colour; but, when preserved in spirit, they become brown, grayish, or white. The strongylus gigas is commonly met with in the kidneys, rarely in other viscera, and still more rarely in the intestinal tube. It has, doubtless, been confounded with the ascaris lumbricoides.

5. *Distoma hepaticum*, *Fasciola hepatica*, *F. humana*, *Fluke* or *Liver Fluke;* Fr. *Fasciole*, *Douve*, *D. du Foie;* Ger. *Leberwurm*, *Leberegel*, *Egelschnecke*, *Schafegel*, a flat worm, an inch—more or less—in length; from four to six lines in breadth; and of a dirty-yellowish, greenish, or brownish colour, has been found in the human gall-bladder, although not often. Thence it passes occasionally into the intestinal canal.

6. *Bothriocephalus latus*, *Tænia lata*, *T. vulgaris*, *Lumbricus latus*, or *broad tape-worm;* Fr. *Tænia non armé*, *Ver solitaire*, *T. à anneaux courts;* Ger. *Bandwurm*, *Breite* oder *Kurzgegliederte Bandwurm*, *Grubenkopf*, is flat, or nearly flat—as its name imports—generally from ten to twenty feet long, and is, at its broadest part, from a few lines to half an inch broad. It is rarely discharged entire; is of a white colour; but, when macerated in spirit of wine, becomes darker, whence its name *Tænia grisea*. A broken specimen of it has been obtained sixty yards long. It is not common in the United States. As a proof of its general infrequency, it is asserted, by a distinguished helminthologist, M. Rudolphi, that, so far as he knows, it has never been met with on dissection.

7. *Tænia solium*, *T. cucurbitina* or *long tape-worm;* Fr. *Tænia armé*, *Ver cucurbitain;* Ger. *Kettenwurm*, *Kürbiswurm*, *Kürbisbandwurm*, *Langgegliederte Bandwurm*, is commonly a few feet long, but, at times, attains an enormous length. It inhabits the small intestines, and has been met with after death. It has been found extending from the pylorus to the distance of seven inches from the anus, and is said to have been seen of the enormous length of 600 feet. It may exist in the intestines along with other worms, although this has been denied by M. Rosen von Rosenstein.

8. The *Ditrachyceras rudis*, *Diceras rude*, (F.) *Bicorne rude*, was first described by M. Sultzer, of Strasburg, in the year 1808; but it was regarded by M. Bremser to have been nothing more than a seed, and was consequently neglected, and almost forgotten. Specimens of worms were, however, sent some time ago, from the island of Bornholm to Professor Eschricht, which had been passed in enormous quantities by a young girl after a severe disease. They were found to be the Ditrachyceras of Sultzer. These, however, are the only cases of the kind on record.

Diagnosis.—If attention be paid to the mode in which entozoa are probably formed, and the gradual manner in which they must be developed in the stomach and bowels, it would seem, that the parts may

be so accustomed to their presence, that they may not, unless when in unusual quantity or of unwonted size, give rise to much irritation, or to symptoms, by which their presence can be diagnosticated. It is, indeed, impossible to pronounce positively as to the existence of worms in the intestines, until we see them in the evacuations. On this point, almost all physicians, at this day, accord: there are still some, however, who place great reliance upon a catenation of symptoms, every one of which may belong to other affections. As the functional disorders, induced by worms, are identical with those induced by irritation of the intestines, it is impossible, independently of the evidence derived from the presence of worms in the evacuations, to decide, whether these disorders be owing to the one or to the other. The symptoms are, indeed, so identical with those of gastroenteritis, that the very existence of worms has been ascribed to that affection. "Worms in the bowels," says a well-known systematist,—M. Broussais,—"are most frequently, but not always, the product of the alteration of the mucus and heat, which results from a gastro-enteritis of greater or less intensity: hence, the very various effects of irritating anthelmintics." That they are accompanied with gastro-enteritic symptoms, at times, is unquestionable; but the condition—as we shall see—which favours their development, is by no means one of inflammation,—in the large majority of cases at least.

As a proof, that they give rise to no pathognomonic signs, even when they may be present in an unusual quantity, it is but necessary to point out some of the symptoms that have been considered to indicate their existence in the alimentary tube. *First.* In the head:—Tumid, pale, or livid face; lower eyelid of a leaden colour; itching or sensation of tension felt in the nose; sense of smell depraved, or lost; epistaxis; discharge of saliva during sleep; fœtid breath; stridor of the teeth; mucous sordes on the tongue; stammering; aphonia; loss of articulation; strabismus; retraction, contortion or fixedness of the eyes; dilatation and immobility of the pupil; objects appearing yellow; sudden amaurosis; moroseness; stubbornness; frightful dreams; cries, and terror, when awake; chorea; risus sardonicus; vertigo; delirium, and stupor. Such are the symptoms, referable to the head alone, which are asserted to have been present, and to have been produced by worms. *Secondly.* In the chest:—Dry, tickling cough; sobbing; interrupted sighs, like those of children; anxiety; pleuritic pains; failure of milk in nurses; hiccup; sensation of a foreign body rising slowly from the stomach along the œsophagus; and one instance is mentioned by Frank, of worms reaching the nasal fossæ, and falling into the larynx, so as to produce suffocation; *and lastly*, in the abdomen:—Irritation in one or more points of the intestinal canal; and sympathetic effects in the whole length; insatiable hunger, with progressive emaciation; appetite variously modified; sometimes nausea, retching, cardialgia, vomiting and expulsion of worms from the mouth; borborygmi; sudden swelling of the abdomen, now and then simulating pregnancy; a sense of coldness, gnawing or tearing in the intestines; inanition; palpitations; sensation of an extraneous body creeping, becoming elongated, or retracted upon itself; partial tume-

faction of the abdomen; meteorismus; eructations; intussusception; tormina; spasms; colic; retraction of the abdominal parietes; tenesmus; hemorrhoidal symptoms; discharge of mucus *per anum* or *per vaginam;* mucous diarrhœa containing very fetid, black fæces; the debris of rotten worms; the annuli of the tænia; or worms rolled in the form of a ball; obstinate constipation; derangement of the menstrual secretion; abortion; whitish or thick urine; dysuria; ischuria; obstruction and inflammation of the intestines, &c. &c.

It thus appears, that there is scarcely a symptom, referable to the nervous system, or to the great splanchnic cavities, which has not been ascribed to worms. Almost all agree, however, that, amongst other matters, the patient complains of a sense of pricking or tearing in the intestines; insatiable hunger; distressing itching of the nose; dilated pupils, &c. &c.; yet there is not one of these symptoms, that does not belong to other affections.

Some have asserted, that the intestinal canal is occasionally perforated by them; but if this have ever happened, it is an extremely rare occurrence. More commonly, an ulcerative process has been established in the intestine, through which the worms have passed.

Not many years ago, a *Febris verminosa* or *Worm fever* was presumed to exist, in consequence of its having been observed, that, in the remittent fever of children, worms are occasionally discharged; but—without meaning to deny that these parasites may be the cause of constitutional disturbance of the kind in question—the opinion, that these fevers are intimately connected with a morbid state of the lining membrane of the intestinal canal, is more consistent with correct observation; and, accordingly, it has been positively denied that there is any such disease as worm fever. It is generally considered sufficient proof, that a disease is occasioned by worms, if they be discharged in its progress. But this is often an erroneous inference. In the disordered condition of the secretions, induced by febrile disease especially, the situation of the entozoa becomes unpleasant to them, owing to the increased heat and modified food; and, accordingly, they migrate; yet they may have had no agency whatever in the causation of the febrile affection. The truth appears to be, that worms may exist in every possible state of the digestive tube, but that they rarely, if ever, accumulate, unless under circumstances to be mentioned hereafter. The cause of their undue accumulation has always, therefore, to be investigated. It is this cause, which must be regarded as the main pathological condition to be combated. Yet there is no doubt, that the worms themselves may, although much less rarely than is imagined, react on the system, by inducing irritation of the intestinal canal, and sympathetic mischief elsewhere. The copious discharge of entozoa should, consequently, attract attention to the state of the system, which gives occasion to their unusual propagation, and to the rectification of this, otherwise the different vermifuges may be administered in vain.

But although the evidences of worms, in general, must be regarded equivocal, we may judge of the presence of one of them,—the *oxyuris vermicularis*,—by the troublesome and almost insupportable itching

within the anus, which, in many instances, is experienced more at evening, and during the night, and is caused by the motion of the worms on the sensible extremity of the intestinal mucous membrane. Occasionally, too, as has been remarked, they creep out of the rectum, or induce procidentia ani; and tenesmus is a common concomitant.

Of the presence of the other varieties of entozoa, we have no pathognomonic symptoms. We can only suspect, says Dr. Marshall Hall, the existence of the formidable tænia, "from a sense of gnawing pain in the stomach; give a cathartic and examine the evacuations." Yet no one, from the simple circumstance of a gnawing pain in the stomach, would be led to suspect the presence of this worm particularly; and, on the other hand, a cathartic may afford no positive evidence, even when tænia is really there. What shall we say of the diagnostic sign, quoted without comment by Dr. Eberle—generally cautious in his assertions, and withal philosophical in his deductions—that "it is stated by authors, that persons, affected with tænia, become uneasy and ill whenever they hear music, particularly the music of an organ at church!"

Causes.—The origin of intestinal worms has been an interesting topic with the physiologist, and has given rise to the renewal of the question, whether the maxim, "*omne vivum ex ovo*," be strictly accurate. There are but two ways in which they could originate within the body,—1. by the reception of germs from without, or by regular generation; and 2, by a fresh formation within the body or by *spontaneous* or *equivocal generation*. It has been considered by Dr. Stokes important to settle this point, in order that we may be able "to establish proper principles of treatment;" but as a question of therapeutics, it may be regarded as of little interest. The important inquiry is into the condition of the animal body, which affords a proper nidus for the germs, if received from without, or which causes their development, if formed within the body. Elsewhere, (*Human Physiology*, 6th edit. ii. 338, Philadelphia, 1846) the author has entered into this question, and has shown, that whilst many distinguished physiologists and naturalists believe in the doctrine of regular generation as applicable to entozoa, and to certain of the lower classes of animals, the mass unhesitatingly give their assent to the doctrine of spontaneous generation. There is great difficulty on both sides of the question. Worms are found in parts that have no external communication,—as in the cavity of the eye, and the muscular or cellular structure; and they have been met with in the intestines of the fœtus in utero. This last fact is one of the strongest difficulties in the way of the germs being received from without; and yet, if we admit of spontaneous generation, it would seem probable, that endless varieties might present themselves. The Ditrachyceras rudis—as already stated—has been met with in but two instances,—once in Strasburg in the year 1805; and once in the island of Bornholm in 1841. It has been remarked by Dr. Stokes that there is not much more difficulty in conceiving the formation of a living worm within the body, than there is in conceiving the organization of a portion of lymph thrown out upon the surface of a serous membrane: the difficulty is indeed extreme in both cases.

Of the remote or predisposing causes of worms, one is climate or locality. In Egypt the tænia solium is extremely common; and in Holland and Switzerland it is often seen. It has been affirmed, that the bothriocephalus latus is met with only in Switzerland, Poland, and Prussia; whilst in England, France, Holland, and Germany, the tænia solium alone prevails; and in those parts of France which border upon Switzerland, the inhabitants are infested by both. According to M. Wawruch, the inhabitant of his own country may suffer from the presence of the bothriocephalus latus; and if this have been got rid of, on changing his residence for Vienna, he may become infested by the tænia solium, which is another genus; whilst the German, who emigrates to Russia, may experience the development of the bothriocephalus latus, a species which rarely or never occurs in his own country. Climate affords, therefore, a predisposition to some kinds at least. In this country, tæniæ are rarely seen, but the ascarides lumbricoides and oxyures vermiculares are very common.

Age is another predisposition, childhood being the most prone to invermination; the oxyures are very common in the first years of existence, and the ascarides lumbricoides at an early age also. Dr. Condie has seen the oxyures nearly as often in the adult as in the child. In the author's observation, this is far from having been the case. At La Saltpétrière, the Parisian hospital for the aged, the ascarides lumbricoides are scarcely ever found on dissection, whilst in the Hôpital des Enfans Trouvés, which is appropriated to the reception of children, multitudes are met with,—as many as forty-two, according to M. J. Cloquet, in the same individual. The bothriocephalus latus and tænia solium are rare in children.

Sex has been usually esteemed a predisposition; worms being presumed to be more common in the female.

It has been already remarked, that Broussais refers the existence of worms, in most cases, to gastroenteritis;—the increased heat and alteration of mucus giving rise to their spontaneous formation; but he presents no facts, on which the mind can rest; and, on the other hand, in acute gastroenteritis, there does not seem to be time sufficient for their development. Indirectly, gastroenteritis, like every other irritation, may occasion the development of entozoa, but only by deranging the functions of secretion and nutrition. They have been met with in all conditions of the intestine,—when it has been red, pale, dry, and covered with mucus. Often they are enveloped in a quantity of mucus, and there is some redness in the part of the lining membrane where they are lodged, but this has been regarded as the effect of their presence, rather than the cause.

The belief has been expressed, that persons in excellent health, and with the intestinal canal in a healthy state, may have worms; and it would appear, that there can be no doubt of such being the fact. The existence of worms can scarcely perhaps be regarded as a pathological state any more than the presence of parasites in the hair; but it may be laid down as a rule, that entozoa are not present in unusual quantity in the intestines, without the existence of a state of imperfect health, which favours their multiplication. In fact, any disorder or debility of

the general system, or of the digestive organs—hereditary or acquired, a scrofulous habit, a sedentary and idle life, a poor diet, a residence in a cold, confined and damp situation,—in short, any thing, that can be the cause of an asthenic condition of the digestive tube, and the surrounding viscera, may be regarded as intimately associated with the undue prevalence of entozoa in the alimentary canal. It is asserted by Mr. Annesley, that the Hindoos who live entirely on rice are so infested with worms, that not more than one in ten is free from them; and it has been imagined by a distinguished helminthologist, M. Bremser, that the use of milk and farinaceous food, has considerable agency in their prevalence in his country. It was in consequence of the belief, that the generation of worms is usually connected with an asthenic condition, that the author placed the class of Anthelmintics,—in which he included not only the agents that destroy worms, but those that prevent their generation,—next to Tonics in the first edition of his "*General Therapeutics.*"

It has been already observed, that locality evidently predisposes to worms, of a certain kind especially; or that worms may be endemic. A verminous diathesis may likewise occur epidemically. Such a complication appears to have existed during a visitation of cholera at Naples. (See page 141 of this volume.)

Treatment.—The indications of treatment, in cases of worms, are clear;—*first*, to destroy or expel the parasites; and, *secondly*, to prevent their regeneration.

Worms may be destroyed or expelled in various ways. The number of reputed vermifuges is very great; but many of them are unworthy of notice, and their place may be well supplied by others that are more in vogue at the present day. Of anthelmintics some are immediately poisonous to worms; others act mechanically upon them, and occasion their expulsion. Of the anthelmintics, which are usually denominated *true*, or which are directly poisonous to worms, there are but few in general use. The seeds of *chenopodium*—the *wormseed* of this country, and those of *santonicum*—the *wormseed* of Europe, are sometimes—frequently indeed—given, (gr. xx.—lx. for a dose;) or the distilled oil, (*Ol. Chenopod.* ♏ v.—x.) in molasses, the dose being administered every night for three nights in succession, and followed up on the next morning by a brisk cathartic;[a] or *spigelia marilandica*, in the form of powder; (gr. x.—lx.) or the *infus. spigeliæ* (f. ʒss.—f. ʒj.); or the *oleum terebinthinæ*, (f. ʒij.—f. ʒj.) in molasses; or the following mixture.[b]

[a] ℞.—Jalap. pulv. ℈ss.
Potass. supertart. ℈j.—M.

[b] ℞.—Ol. tereb. fʒss.
Vitell. ovi
Aquæ menthæ fʒij. f. haustus.

Dr. Bellingham, of Dublin, does not esteem it necessary to administer the oil of turpentine, in cases of tænia, in the large doses which have been usually recommended. He asserts, that it will be equally effectual, if the system be kept for some time under its influence, by giving it in moderate doses, two or three times in the twenty-four hours, occasionally exhibiting a larger dose; and if no cathartic effect follows, combining it, or following it up with castor oil. He usually gives

f 3ss. to f 3j. three times a day, and should this occasion strangury, he does not increase the dose. If, however, it be well borne, he gives, on the third or fourth day, one ounce, with or without the same quantity of castor oil, and repeats it on the following day. These are the anthelmintics or worm-destroyers usually employed. In cases of tænia, however, especially, other remedies have been recommended. The Germans extol highly the *Oleum animale Dippelii* or *Dippel's animal oil*, which is obtained by distilling animal matters—as bones or harts-horn shavings—on the naked fire. The product is excessively nauseous, so that many stomachs cannot tolerate it; (dose, ℞ v.—xx.) The *empyreumatic oil of Chabert*, which is made by adding one part of the animal oil to three parts of the oil of turpentine, leaving them to combine for four days, and then distilling three parts, has been highly extolled. It, likewise, is extremely nauseous. The dose, advised to be taken, is a teaspoonful three times a day. Should these means fail, but little reliance can be placed on the hundred other anthelmintics that are prescribed. A strong decoction of the helminthocorton—*Fucus helminthocorton*—has been recommended, on the authority of Dr. James Johnson, as the most powerful of all anthelmintics; and, it is affirmed, that when thrown into the rectum, it "destroys any worms domiciliating there as effectually as choke-damp would destroy the life of a miner."

The mechanical anthelmintics,—or those that act upon the worms by rendering their situation unpleasant to them, and thus inducing them to migrate,—are few in number, and but little employed in this country. Granular tin, *stannum granulatum*, has been recommended. It may be administered in molasses, (3j.—3ss.) and it can be readily understood, that the scraping of the metal over the lining membrane of the stomach and small intestines may augment chylosis, and improve the tone of the digestive functions in general.

The mode in which the pubes or down of the *mucuna* or *dolichos pruriens* acts is singular. When placed in contact with the cutaneous surface, it excites intolerable itching; yet, when taken internally, mixed with honey and molasses, it excites no irritation of the mucous membrane of the digestive tube, but penetrates the bodies of the worms so as to lead to their expulsion. This strange circumstance has induced many to doubt the facts, that have been put on record in its favour, yet it is impossible to set aside the testimony of so many respectable observers. It is given simply mixed with soft honey, syrup, or molasses, (dose, one teaspoonful to two or three, night and morning,) a cathartic being administered on the third morning. It has been proposed to exhibit in the same cases the short and thick bristles, that are found on the involucre or cupula surrounding the nut of *Corylus rostrata* or Beaked Hazel. They have been found to possess similar virtues with mucuna, and to be equal to it in all respects. They may be given in syrup, molasses or other consistent vehicle, and in the same doses. (*New Remedies*, 5th edit. p. 212. Philad. 1846.)

For the expulsion of worms, cathartics are valuable agents, but they must not be so often repeated as to induce debility of the diges-

tive organs. For the expulsion of the ascarides lumbricoides, the purgative treatment has been esteemed, by some, the most successful of all. Any of the ordinary brisk cathartics[a] may be given every other day, or less frequently, as the case may seem to require.

[a] R.—Jalap. vel rhei pulv. gr. xv.
Hydrarg. chlorid. mit.
Zingib. pulv. āā gr. v.—M. et. f. pulvis.

Croton oil has been extolled by some, especially in cases of tape-worm. The occasional use of a brisk cathartic may also stimulate the digestive tube to a more healthy action, and at the same time remove the intestinal secretions that favour the reproduction of the entozoa.

Such is the general treatment to be pursued; but where the particular variety of intestinal worms is known, this may admit of a special management. Thus, as the oxyures vermiculares are chiefly in the rectum, they are more readily reached by enemata. Still, it may be advisable to conjoin remedies administered by the mouth, as they have occasionally been rejected by vomiting, and the enemata may induce them to migrate. The enemata may consist of a strong solution of common salt, or of the sulphate of iron;[a] or aloes;[b] or turpentine;[c] and a dose of aloes, or of aloes and calomel,[d] may be given.

[a] R.—Ferri. sulphat. ℥ij.
Aquæ Oss.—M.

[b] R.—Decoct. aloes
Lactis āā f ℥iv.—M.

[c] R.—Ol. tereb. ℥ss.
Vitell. ovi
Aquæ Oj.—M.

[d] R.—Aloes pulv. gr. x.
Olei succin. gtt. v.—M. et divide in pil. ii.; or,
R.—Aloes pulv. gr. viij.
Hydrarg. chlorid. mit. gr. iij.
Ol. succin. gtt. iij.—M. et divide in pil. ij.

At times, the oxyures are collected in a ball, and so enveloped in mucus, that the enemata cannot reach them. In such case, it has been advised, that the patient's middle finger, smeared with lard, should be introduced as far as possible into the rectum, so as to rub the worms from the surface to which they are applied, and, as it were, to scoop them out from the rectum. This plan, the author has not found necessary.

In cases of ascarides lumbricoides, anthelmintic enemata cannot be needed, as the entozoa are in a higher portion of the tube. They must be treated on the general principles already laid down; and, as regards the bothriocephalus latus and the tænia solium, the most powerful anthelmintics, oil of turpentine, oil of Dippel, and the empyreumatic oil of Chabert are needed.

Several portions of tænia having been discharged after the administration of creasote, it has been prescribed as an anthelmintic,—five to eight drops being given to adults combined with oleum ricini, or with half a drop or a drop of croton oil.

The male fern—*Filix mas*—which si the basis of Madame Nouffer's celebrated remedy, (℥j. of the powdered root, every other hour for three hours; with half an ounce of fresh-drawn *castor oil* on the alternate hours, until three half ounces have been taken,) as well as the ethereal extract,[a] have been much extolled, especially by the physicians of Continental Europe; but, perhaps, the remedy, that has re-

ceived the most testimony in its favour, is the bark of the root of the pomegranate, which is generally given in decoction.[b] The alcoholic extract is also occasionally administered,[c] followed by a cathartic. A recent writer—M. Merck—states, that when properly administered, pomegranate root never fails.(!) The method he advises is the following. Whenever a patient has evacuated portions of tapeworm, he must take on the same day, or the next, a decoction of two ounces of the fresh bark in a pint and a half of water reduced to a pint, in three doses, leaving an interval of half an hour between each dose. The worm, he says, will be evacuated at the utmost in twenty-four hours, and no relapse need be feared. Want of success, he affirms, is owing to the dry bark having been employed; to its being adulterated with other barks; or to too long an interval having been permitted to elapse, after the discharge of the parasite, before its use was commenced; to the dose being too weak, or to its being combined with cathartics. Where the bark is taken, a cathartic is not needed: this is not the case with the male fern, which requires to be followed by a cathartic.

[a] R.—Ext. æther. filicis maris ℥ss.
Mellis vel
Theriac. ℥ss.—M.
Dose, one half, at night, and the other, next morning.

[b] R.—Granat. cort. rad. ℥ij.
Aquæ Oij.
Coque ad. Oiss.
Dose, f℥ij. every hour: three or four doses are usually sufficient to expel the worm.

[c] R.—Ext. cort. rad. granat. alcohol. ℥vj.
Aquæ menthæ f℥iv.
Succ. limon. f℥ij.—M.
Dose, one quarter, every quarter of an hour.

Brayera anthelmintica or *Hagenia Abyssinica*, a native of Abyssinia, and known there by the name *cusso* or *kosso*, has been advised in tapeworm. The flowers are the parts administered, and they are given in decoction; but sufficient quantities of the plant have not been exported from Abyssinia to test its efficacy.

When a portion of tænia protrudes from the rectum, it has been advised, with the view of destroying it, to apply hydrocyanic acid to it.

After all, the most important agents are those that are strictly anthelmintic, or which prevent the development of entozoa. Should there be any evidence of gastro-enteritis, it must, of course, be removed; but generally, the main predisponent, although it may be gastro-enteric, is not gastro-enteritis. It is a state opposite to inflammation of the lining membrane; and any remedy, that will improve chylosis and the nutrition of the body, is a valuable agent. Charcoal (*Carbon. lign. pulv.* gr. x.—3j.) is in this way anthelmintic, as well as the free use of salt, the want of which gives rise to entozoa in both man and animals. (The author's *Human Health*, p. 268, Philadelphia, 1844.) A nutritious diet, especially of animal food; regular exercise and change of air, as far as is practicable, are to be inculcated; with which may be conjoined the use of the ordinary tonics, as colomba, gentian, &c., prescribed in infusion.

To remove the verminous habit, it has been recommended by Bremser to combine aloes, iron, and the sulphuric acid.

R.—Tinct. aloes comp. f℥j.
Tinct. ferri pomati f℥j.
Elixir vitriol f℥ss.
Dose, 10, 20, or 30 drops, three or four times a day, in a glass of wine and water.

The *tinctura ferri pomati* is not contained in the British pharmacopœias, and, therefore, a substitute has been recommended by Dr. Stokes.

R.—Tinct. ferri chloridi
Aloes ää p. æ.
Dose, 20 drops, three or four times a day.

The aloes acts as a vermifuge and cathartic, whilst the salt of iron exerts its tonic influence.

Lastly, worms, or the larves of insects, are occasionally introduced into the intestinal canal by accident, where they occasion more or less intestinal disturbance. The animalcules, which have been most commonly swallowed, are the hair-worm, the leech, the grub of the fly, and the caddy insect,—*phalæna pinguinalis;* the larve of the bee, the spider, the *triton palustris*, *lacerta aquatica*, &c. To these, collectively, the terms *Helminthia erratica*, *Ectozoa*, and *Pseudo-helminthes*, have been appropriated. In their new situation, these are often so much changed as not to be recognised. In animals, bots are produced by swallowing the ova of the *œstrus* or gad-fly; and cases are on record of their occurring in the human snbject.

When such adventitious parasites are supposed to be present, the true anthelmintics must be first recommended, and afterwards any of the ordinary cathartics.

CHAPTER V.

DISEASES OF THE PERITONEUM.

The peritoneum lines the abdominal parietes, and gives a coat to most of the viscera. It is a serous membrane, and, like all membranes of the class, is the seat of a secretion of thin albuminous fluid, which keeps it moist. It forms essentially a shut sack, in the cavity of the abdomen, and has, in reality, no viscus within it. If the diaphragm be assumed as the part at which it commences, it will be found extending thence over the abdominal muscles, reflected over the bladder, and, in females, over the uterus; thence over the rectum and kidney, enveloping the intestines, and contituting by its two laminæ the mesentery, giving a coat to the liver, and receiving the stomach between its duplicatures. Its use is to fix and support the different viscera, and, by means of its secretion, to enable the intestines to move readily upon each other. When we speak of the cavity of the peritoneum, we mean the inside of the sack: the fluid of ascites is contained within this cavity.

After the peritoneum has covered the stomach and intestines, it forms reflections, which are fatty, and termed *omenta* or *epiploa.*

The peritoneum generally may be affected with disease; or the mischief may be partial; and the symptoms may be materially modified, according to the particular viscus which it invests. Of peritonitis of the intestines, for example, we have already spoken under the head of Enteritis of the Peritoneal Coat; and other peritoneal inflammations are treated of under the diseases of the particular viscera which are invested by it. It is convenient, however, to treat here of those affections that appertain to the peritoneum generally.

I. INFLAMMATION OF THE PERITONEUM.

Synon. Inflammatio Peritonæi, Peritonæitis, Peritonitis, Empresma Peritonitis, Cauma Peritonitis; *Fr.* Péritonite, Inflammation du Péritoine; *Ger.* Entzündung des Bauchfells.

Inflammation of the peritoneum may be described under three heads: 1, the *acute* form; 2, the *chronic;* and 3, the *puerperal.*

1. *Acute peritonitis.*

Diagnosis.—The symptoms are essentially the same as those of acute enteritis of the peritoneal coat. A sharp pain is experienced in some part of the abdomen, which may be circumscribed, or extend over the whole lower belly, and is superficial when it affects the peritoneum lining the abdominal parietes, so that the slightest pressure is insupportable: even the weight of the bed-clothes excites intolerable suffering. The parietes of the abdomen are more or less tense and tumid; the countenance has, at times, a peculiar expression—the upper lip being drawn upwards, and bound tightly over the teeth. The patient breathes costally, without depressing the diaphragm more than he can

help, and lies upon his back, with the thighs bent upon the pelvis, and the knees frequently raised, so as to take off the pressure of the bed-clothes. The pulse is generally small, and the skin hot and dry; and a recent writer, M. Sementini, affirms, as a fact, which he has tested by constant observation for upwards of forty years, that in all cases of peritonitis, in whatever part of the abdominal cavity the inflammation may be seated, there is pain in the pubis, and upon the great trochanters; which, if not felt spontaneously, is always developed by pressure, and of which the severity is directly proportionate to that of the peritonitis. This fact, which, according to M. Sementini, is confirmed by the clinical observations of others, has not been observed by the author. It is attempted to be explained by the relation of the nerves of the parts in which pain is felt to the peritoneum, and by its connexion with the fasciæ and muscles about them. Along with these local signs, the functions of the stomach and bowels are always more or less disordered; but often there is neither vomiting nor constipation; or, if the bowels are confined, they are easily moved by cathartics.

Acute peritonitis may terminate unfavourably in a few days; but when its course is more protracted, there may be evidences of seropurulent effusion into the cavity of the peritoneum. This is not necessarily fatal, as the fluid may be absorbed, or form a communication between the cavity of the peritoneum and the intestines. The signs, that denote the termination of the inflammation in effusion, are—diminution of the pain and swelling, with a doughy feel of the abdomen, and infiltration of the parietes of the abdomen and the lower extremities. By percussion, the presence of fluid may be detected, and auscultation may afford evidences of peritonitis before and after effusion has taken place. As in other inflammations of serous membranes, the first effect is to arrest the secretion, so that the membranes are dry, and careful auscultation has detected a sound of *frottement* or friction. The effusion of coagulable lymph can likewise be detected in the same manner, as well as by the hand applied over the abdomen. In a case of peritonitis supervening on ovarian dropsy, described by Dr. Beatty, when the hand was applied over the umbilicus and its neighbourhood, the sensation communicated to it, when a full inspiration was taken, was that of a grating or rubbing together of two uneven and rather dry surfaces. By the aid of the stethoscope, a loud and distinct friction sound was audible, over a space about five inches in diameter, with the umbilicus for a centre. Another pathologist, Dr. Bright, states, that he has observed, on several occasions, that when the circumstances of the disease had rendered it probable, that adhesions had taken place between the viscera and the peritoneum of the abdomen, a very peculiar sensation was communicated to the touch, varying between the crepitation produced by emphysema, and the sensation derived from bending new leather in the hand. It has been presumed by Dr. Corrigan, that for the production of this sign, the effused lymph must be in an unorganized condition, and also by Dr. Beatty, that it is observed only in cases, where one at least of the opposed surfaces is adherent to a solid resisting body, and it would

appear from Dr. Stokes, that in twelve collected cases nine presented an organic tumour.

Where the peritonitis is partial, the *local* phenomena are circumscribed, and the *general* less marked.

The blood, according to M. Simon, exhibits, in a tolerably well-marked degree, the characters of hyperinosis. The tolerance of loss of blood, as in other inflammations of serous membranes, is great, and these circumstances must be regarded as a means of diagnosis, and a guide in the treatment of the disease. It is not unfrequent in the fœtus.

Causes.—Those, usually assigned—as in other cases of internal inflammation—are cold and fatigue. An irregular state of the bowels, as well as contusions and wounds, may also give rise to it. At times, it supervenes on surgical operations, on extensive abscesses, especially when of a specific kind, and on burns. The essential causes are those of internal inflammation in general. It is said by MM. Andral and Most to have been caused by the metastasis of rheumatism and gout, but enteralgia is a more frequent consequence.

Pathological Characters.—When peritonitis has terminated speedily, the peritoneum may be found red, sometimes of a violet hue, and dry, owing to the arrest of the wonted secretion. It has been maintained, that fatal inflammation may have existed, and yet that on dissection there may be no redness,—in other words, that the absence of vascularity is no proof of the previous nonexistence of inflammation; but this has not been the result of the author's observation. It applies to hyperæmia, but not to inflammation, which cannot exist for even a short time, and prove fatal, without organic changes being effected in the part, which leave manifest traces on dissection; and even if we do not agree, that increased redness is always perceptible after death, we have no doubt as to the presence of other appearances, which can scarcely escape the eye of the practised observer. Where the inflammation has seriously implicated the peritoneum proper, as well as that covering the intestines, they are often found glued together by plastic lymph, the omentum adhering to the lower folds of intestine, the adhesions being slight, or firm, according to the length of time that has elapsed between their formation and the fatal event. If the disease has continued for some days, the cavity of the abdomen may be found to contain a turbid whitish, yellowish, or greenish fluid, with flakes of coagulable lymph, the same morbid secretion as the bond of union between the agglutinated intestines. It is at times very fetid. Occasionally, also, pus is secreted in considerable quantity from the thickened membrane; and instances occur in which there are evidences of gangrene. In some cases, the intestines are perforated, and the contents of the digestive tube found in the cavity of the peritoneum. An exhalation of blood has also been met with, constituting the *Hémapéritonirrhagie* of M. Piorry.

Treatment.—This is essentially that recommended for enteritis of the peritoneal coat, which is, indeed—as elsewhere remarked—peritonitis, somewhat modified by the subjacent intestine. As in other inflammations of the serous membranes, mercury administered internally or by friction, so as to induce ptyalism promptly and effectually, has been

advised, but this revulsive treatment must be subsidiary to the antiphlogistic. It is not easy, indeed, to produce the effects of mercury upon the system, unless the latter has been energetically premised.

R.—Hydrargyr. chlorid. mit. gr. iij.
Opii gr. ss.
Confect. rosæ q. s. ut fiat pilula.
One to be taken every three or four hours.

Chronic Peritonitis.

Diagnosis.—Acute peritonitis may terminate in chronic, or it may have, from the first, the characters of the latter, and be very insidious, so as to require great attention in its detection. The symptoms are much less marked, the abdominal pain less acute, sometimes almost null, and only to be detected by careful pressure. It is even affirmed by Dr. Marshall Hall, that there may be no pain, tenderness, or tumour of the abdomen. The abdomen is tense, and doughy, as in the acute form; often, indeed, more manifestly so, and the fluctuation more perceptible, inasmuch as careful percussion can be practised. The pulse is small, more frequent than natural, and especially so towards evening. There is usually neither vomiting nor purging, and the appetite may persist; the emaciation is progressive, and there is evident hectic, under which the patient is gradually worn out.

Pathological Characters.—The appearances on dissection resemble those of acute peritonitis. The effusion of fluid is, however, more considerable, and the organic mischief more complicated. The peritoneum itself is generally thickened, has entirely lost its transparency, and is variously discoloured. Often, there are numerous black patches, which have been considered melanic by M. Andral. They are not gangrenous sloughs, for they are firm, inodorous, and possess none of the characters of gangrene except the colour. The agglutinations of the different viscera are, at times, extensive, and constitute tumours or bands, which may occasionally be felt through the parietes of the abdomen: at other times, the intestines are perforated by ulceration, and death takes place speedily, owing to the effusion of the contents of the digestive tube into the cavity of the peritoneum; whilst, in others, the pus makes its way through the abdominal parietes, owing to the union of the intestines to the peritoneum lining the abdomen, and is discharged externally. In a case of tubercular peritonitis, which fell under the author's care, the external orifice in the parietes of the abdomen was found to communicate with a circumscribed cyst, formed by the agglutination of the omentum to the anterior paries of the abdomen, and by the intestine. It extended into the pelvis, and as deep as the vertebræ, dipping between the folds of the intestines. The walls were ulcerated, and in parts almost gangrenous, containing a greenish, fetid matter. On pressing the intestines, bubbles of air issued from two or three openings, all of which communicated with the cavity of the cyst. On examining it more closely, three perforations were found near each other in the lower part of the ileum, and one in the colon. The intestines were glued in spots to each other and to the anterior paries of the abdomen, partly by old organized adhesions, and partly by new ones. In this case, the surface of the

intestines as well as the omentum, and the peritoneum lining the walls of the abdomen, were thickly studded with tubercles, varying in size from that of a pin's head to that of a small pea, and no lymph or serum was found in the cavity of the peritoneum. It has been remarked by an eminent pathological observer—M. Louis—that chronic peritonitis, which has been such from the commencement, is always complicated with tubercles; and the fact certainly is, that they are generally coexistent. The mesenteric glands or ganglions are often, also, greatly enlarged. M. Louis farther affirms, that the existence of tubercular peritonitis alone will justify the diagnosis of pulmonary tubercles, although no pulmonary symptoms may be present. Cases, however, of tubercular peritonitis have occurred to Sir H. Marsh, Dr. F. Churchill, Dr. O. B. Bellingham, the author, and others, in which there were no accompanying tubercles in the lungs.

Tuberculous peritonitis may exist without giving rise to any marked phenomena, and ultimately terminate rapidly. The patient may have suffered under slight abdominal uneasiness, with falling off of the general health and strength, when suddenly he is seized with greater pain than usual; the vital powers fail rapidly, and he may die within thirty hours. In cases where there is no pain and but slight tenderness, with little disorder of the digestive organs, the principal guide to diagnosis, according to Dr. F. Churchill, is the enlargement of the abdomen, which always occurs ultimately, and the fluctuation, which, by a little care, may always be perceived. Dr. Seymour affirms that there is a peculiar kind of vomiting pathognomonic of the disease. It is of a green so dark that it is only to be compared to that which the sea acquires at great depths; or blue as intense nearly as that of indigo; deep green when regarded in one way, blue in the other.

Treatment.—This in no respect differs from that adapted for chronic enteritis of the peritoneal coat.

3. *Puerperal Peritonitis.*

Synon. Puerperal Fever, Peritoneal Fever, Child-bed Fever, Febris Puerperalis, Enecia Synochus Puerperarum, Erythematic or Nonplastic Peritonitis, Typhohæmic Peritonitis, Adynamic or Malignant Puerperal Fever, Low Fever of Child-bed; *Fr.* Fièvre Puerpérale, Péritonite Puerpérale, Métropéritonite Puerpérale, Typhus Puerpéral; *Ger.* Kindbetterinfieber.

The nature of puerperal fever has been a topic of warm controversy, in recent times more especially, but there can be little hesitation in referring it to inflammation of the peritoneum, modified by the existing condition of the female, or by a prevailing epidemic constitution, and one which has often been favourable to the spread of erysipelas. A *coup d'œil* of the various opinions has been given by Dr. Churchill, in his *Diseases of Pregnancy and Childbed.*

Diagnosis.—It has been affirmed, that when peritonitis follows delivery, the abdomen—the walls of which have undergone considerable distension, and have not yet resumed their wonted resistance—acquires a greater size than in ordinary peritonitis; the lochia are suppressed, the mammæ shrunken, the secretion of milk suspended, &c. On the other hand, it has been equally affirmed by Professor Hamilton, of Edinburgh, that a striking mark of distinction between diseases which

resemble each other in the prominent characters of fever and pain in the belly, is, that in the true puerperal fever, the lochial discharge never ceases. The truth would seem to be, that the discharge sometimes flows as in ordinary cases; is sometimes diminished, and, in others, suppressed—the condition described by Professor Hamilton being the least common, inasmuch as the secretion is likely to be interfered with by the concentration of vital action towards the peritoneum. The same effect may be expected upon the secretion of milk, if it have been already established; but if the secretion have not taken place at all, it is apt to be postponed until two or three days after convalescence takes place.

If a patient, soon after delivery, have an unusually frequent pulse, and this is not the result of nervous exhaustion from hemorrhage—the pulsations being, at the same time, not only frequent but quick and vibratory—serious internal mischief has to be apprehended; and if to this there be superadded—tenderness over the region of the uterus especially, or about the iliac fossæ, with diminished lochial discharge, partial or general peritonitis may be anticipated. The diagnosis, however, of puerperal peritonitis often demands the most careful investigation. The formidable symptoms are exhibited by the pulse, which is generally very rapid; by the countenance, which is remarkably anxious and sunken; and by the nervous system, which is greatly agitated and depressed,—low, muttering delirium being a common concomitant; and, after a short time from the inception, the tolerance for bloodletting being extremely small, and the blood dark, and of loose coagulum.

The blood, in this disease, according to M. Simon, exhibits, in a well-marked degree, the characters of hyperinosis. He made two analyses, and found that the fibrin amounted to twice as much as in healthy blood. Similar results were obtained by MM. Andral and Gavarret; but in two cases there was a considerable decrease in the quantity of fibrin below the ordinary standard of the blood in inflammatory diseases.

The urine, in a case examined by Simon, was of a decidedly inflammatory type. It was of an acid reaction, and somewhat turbid, but not particularly dark. When examined with the microscope, it was found to contain mucous corpuscles, membranous shreds and other fragments, which could only be taken for epithelium composed of heavy, regularly formed, large and elongated cells. On the application of heat, the presence of a small quantity of albumen was detected. The specific gravity was 1020. M. Bouchardat found in one case the urine milky. It contained no traces of sugar of milk or casein, the appearance being owing to a large amount of urate of ammonia. It was, moreover, remarkable for the large quantity of fat and of albumen. It was clear when first discharged, and only became turbid on cooling.

Causes.—In addition to those laid down under ordinary acute peritonitis, there must be a peculiar condition of the frame, in association with the great change in the organs consequent on delivery, to induce puerperal fever, particularly in the epidemic form. It has been con-

tended, that the phenomena of puerperal fever originate in a vitiation of the fluids, the causes of which are especially rife after childbirth, and are seated in the uterus, from which the placenta has been separated. The bruised condition of the pelvic cavity; the abraded state of the mucous membrane of the uterus, where the placenta was attached; the gaping orifices of the veins and sinuses; the offensive lochial discharges, and the injurious effects of mechanical injury; retention of coagula, or of portions of placenta, or of dead and putrid children; all, or any of these conditions, have been regarded by Drs. Ferguson and Locock as ready sources from which vitiated matters can be absorbed into the circulation. A recent writer, M. Voillemier, regards it as essentially a general disease, and that its anatomical character consists in the existence of purulent matter in some part of the body.

Where the disease affects numbers in a community at the same time, there must be a favourable constitution of the atmosphere, and, according to some, a contagious miasm, which emanates from the bodies of those labouring under the disease, and which can even be conveyed by the practitioner to other parturient females, and affect them also. In many epidemics of puerperal peritonitis, in the lying-in institutions of large cities, woman after woman has become attacked as they were delivered, especially where there had been close communication with the patients labouring under the disease, or they had been attended by accoucheurs, who had previously visited others without making the necessary change in their dress. According to many observers, the miasm, presumed to arise from an individual labouring under puerperal fever, is more virulent than that of almost any disorder reputed to be contagious; and examples have occurred of all the patients of one partner in a medical firm having been successively attacked after delivery, when those of another partner had entirely escaped. Many striking examples of this nature have been recorded by Dr. Oliver W. Holmes, and by Dr. Samuel Kneeland, jun., of Boston; and at a discussion at the College of Physicians of Philadelphia. Dr. Condie stated, that although not a believer in the contagious character of many of those affections generally supposed to be propagated in that manner, he had become convinced by the facts that had fallen under his notice, that the puerperal fever then prevailing (1842), was capable of being communicated by contagion. "How otherwise," he asked, "could be explained the very curious circumstance of the disease in one district being exclusively confined to the practice of a single physician, a Fellow of the College extensively engaged in obstetrical practice, whilst not an instance of the disease had occurred under the care of any other accoucheur practising within the same district. Scarcely a female that had been delivered by this gentleman for weeks previously, had escaped an attack." Still, although these and numerous other facts and arguments, impel us almost irresistibly to believe in the contagious nature of puerperal fever, there are many who deny that the spread of the disease occurs by contagion, and who refer it wholly to epidemic influences.

Pathological Characters.—These are essentially such as have been described under acute peritonitis. The fluid effused is usually whey-

like, or milky in appearance, and contains pus, with flakes of coagulable lymph. The disease, it has been supposed by Dr. Mackintosh, commences in the peritoneum forming the broad ligaments, whence it spreads to a greater or less extent. The pleura is frequently found inflamed, as indicated by the existence of a similar sero-purulent effusion in the chest: there is sometimes evidence of inflammation of the brain; and, not unfrequently, the tissues of the uterus and ovaries are broken down and pulpy,—that of the uterus being soft, and often approaching to gangrene.

Treatment.—Puerperal peritonitis is more severe and extensive than ordinary peritonitis, and, according to some, is more frequently combined with venous congestion, which masks the inflammation, and deceives the practitioner. It consequently requires a very early treatment, and if energetic means be not employed within twelve hours after the attack, and, at times, within six, all the efforts of the practitioner may prove futile. The inflammation must be subdued, and speedily, or the patient will die; and hence bloodletting, practised at as early a period as possible, is one of the sheet anchors of the therapeutist. Both in the well-developed, and in the congestive forms, it must be mainly relied on. Eighteen or twenty ounces of blood should be drawn from the arm, as soon as possible after the inception of the disease, and the operation be repeated in four hours, should the symptoms appear to demand it, and the strength of the patient permit.

Leeches have been highly extolled by many practitioners. One hundred, one hundred and fifty, two hundred, and two hundred and fifty have been applied from first to last; but the number, to be advised in any case, must be left to the judgment of the practitioner. In the congestive form, whilst blood is drawn from the arm, or by means of leeches, it may be advisable to combine with it gentle stimulants, as wine-whey, placing the patient at the same time in a bath of 92°—96° Fahrenheit; by which means the blood is solicited towards the surface, and the hyperæmia of the peritoneum consequently diminished. If meteorism exists, warm water thrown into the colon, or the common enema of spirit of turpentine, may afford relief. In all cases, stimulants, administered internally, must be prescribed with caution, and not unless the ordinary indications for their administration in other diseases should be present. Abstraction of blood and purgatives of calomel have been described as "the arms on which we have chiefly, if not solely to depend;" and both, it is added, should be employed decidedly, and to as great an extent as we dare; but cathartics ought not to be administered too freely; and it is, on the whole, better to keep the alimentary canal clear by laxatives and laxative enemata; and if the disease should not yield speedily to the sedatives recommended above, and to the various local applications advised for the forms of peritonitis already described, to endeavour to affect the system gently, by means of mercurials, administered either internally, or by friction with mercurial ointment, dressing the blisters, if any have been applied, with the same ointment. Large quantities of mercurials have been given, and extolled by some. One patient of Dr. Collins took, in the course of treatment, an ounce of calomel! and

twenty grains, every four hours, has not been an uncommon quantity; but large doses of calomel have not proved so successful in the hands of Dr. Locock and others.

As to the topical remedies and the general management, they have already been described under Acute and Chronic Peritonitis. It may be added, however, that injections of warm water have been recommended to be thrown into the vagina and uterus, three or four times a day. An able writer, Dr. Churchill, says he has frequently syringed the vagina with warm water, with benefit, but he never threw injections into the uterus.

Such will be the plan of treatment usually, perhaps, most successful. It is founded upon the best pathology; but great judgment is required on the part of the practitioner. It would appear to be incontestable, that, in certain epidemics, and cases of the same epidemic, which may require the general management detailed above, active treatment cannot be borne. The phenomena are, from the first, of an adynamic character; and the practitioner will soon find, that the same plan of treatment cannot apply to all. As in all cases of the kind, it must be regulated by the character of the prevailing epidemic, and the condition of the patient. The disease, in spite of every care, is often most alarmingly fatal, and is always regarded with terror by the obstetrical practitioner. It is affirmed, indeed, to occasion seven-eighths of the total mortality in childbirth.

II. DROPSY OF THE PERITONEUM.

Synon. Ascites, Hydrops Abdominis, Askites, Hydroperitonia, Cœliochysis, Dropsy of the Lower Belly; *Fr.* Ascite, Hydropisie du Bas-ventre; *Ger.* Bauchwassersucht, Wassersucht des Bauches, Bauchwassererguss.

Diagnosis.—Dropsy of the peritoneum is known by enlargement of the abdomen, commencing in the hypogastric region, and gradually ascending upwards, until the abdominal parietes are, at times, so distended as to be extremely thin, and almost transparent, with tortuous veins observable in various parts. Percussion over the seat of the fluid yields a sound, which has been regarded as intermediate between that afforded by percussion of the liver and of the small intestine. When the patient is in the upright posture, the distension of every portion of the umbilical and hypogastric regions is equable; but, if he lie on either side, or on the back, the position of the fluid being varied, the prominent portion of the abdomen is varied likewise. If the hand or extremities of the fingers be placed on one side of the abdomen, below the level of the surface of the fluid, and the opposite side of the abdomen be struck, a feeling of fluctuation is perceptible, which is more or less distinct, according to the greater or less distension of the parietes of the cavity. When it is not very evident, it may be best detected by placing the pulps of one or two fingers on the iliac fossa, and tapping the opposite iliac region slightly, but briskly, with a finger of the other hand. The only inconvenience of which the patient complains is the feeling of weight in the lower part of the abdomen, until the accumulation of fluid becomes so great as to cause the abdominal viscera to press upon the diaphragm, and excite dyspnœa. The secretion of

urine is generally scanty, and the cutaneous transpiration diminished likewise. In active ascites, the urine, according to M. Simon, is of a dark red or brownish colour, and not unfrequently contains blood in a state of solution, or blood-corpuscles. The latter may be recognised by the microscope, and if the urine be allowed to stand, they form a red sediment; frequently, however, albumen only is present. On the approach of recovery, there is, according to M. Schönlein, a copious discharge of urine, accompanied by a purulent, and, subsequently, a mucous, sediment. At the commencement of chronic ascites, the urine is not much diminished in quantity; it assumes a pale or opalescent, shining green colour, and contains a large quantity of albumen and mucus. In the varieties of ascites, that arise from affections of the liver, spleen, stomach, &c., the amount of urine is also diminished. It appears either of a dark red or brown colour, without sediment, or it throws down copious lateritious or fawn-coloured sediments; and at times it is coloured with bile, as in jaundice.

As ascites—like dropsy in general—is, in most cases, rather the evidence of a pathological condition than a pathological condition itself, the course of the disease is usually dependent greatly upon the visceral mischief, which gives rise to it. At times, the distension is so excessive, and the inconvenience sustained by the presence of the fluid so great, that it is necessary to perform the operation of paracentesis, and this may have to be repeated over and over again; the quantity of fluid, which has been abstracted in this way, is indeed enormous, and scarcely to be credited, did it not rest on unquestionable authority. Twenty-one gallons have been removed at a single operation, and the operation has been repeated one hundred and forty-three times, and perhaps oftener. A few years ago, a case was reported to the *Académie Royale de Medecine* of Paris, by M. Lecanu, in which paracentesis was performed eight hundred and eighty-six times, in the space of sixteen years. Three thousand eight hundred and twelve gallons—Imperial measure—were discharged, and the woman was ultimately cured by methodical compression of the abdomen. In one case, reported by Dr. Beall of Missouri, it was performed ninety-six times within a few years, and the whole amount of fluid evacuated was two hundred and seventy-five gallons and a half; the first fifteen operations yielding an average of twenty quarts.

Ascites may be confounded with encysted dropsy—as of the ovary—but a careful examination, with the history of the case, will exhibit the difference. Instead of the swelling being equable—as in ascites—it will be partial, and more prominent in some part of the abdomen than another—the intestines being pushed to the part opposite the tumour. It is possible, too, to confound it with pregnancy, where the abdominal distension is very great owing to the quantity of liquor amnii, and the fluctuation is very manifest. A case of this kind occurred to Sir Astley Cooper and Dr. Haighton, of London, in which these gentlemen were so far deceived as to appoint a day for the operation of paracentesis, when fortunately, in the meanwhile, the lady was taken in labour and delivered. The discharge of liquor amnii was enormous.

In rare cases, the ascitic effusion presses upon the recto-vaginal portion of the perineum so as to cause a tumour to form *in perineo* in which fluctuation is manifest,—a fact that ought to be borne in mind.

At times, collections of fluid form in cysts which have no communication with the cavity of the peritoneum. These are generally placed outside that membrane, and usually in cysts,—constituting *Extraperitoneal Dropsy.* Like encysted dropsies, in general, they of course occupy a more limited or circumscribed space of the abdomen, in the first instance, than ascites, and may be diagnosticated accordingly. A case of the kind occurred to the author in the Philadelphia Hospital, Blockley. The precise situation of the dropsical collection was not revealed until after death.

Causes.—Ascites—like other dropsies—arises in consequence of a loss of balance between those vessels whose office it is to secrete the fluid that lubricates the peritoneum, and those that take it up. If the exhalents secrete too much, the absorbents remaining healthy; or if, on the other hand, the exhalents remain healthy, whilst the absorbents take up too little, accumulation of serous fluid takes place, but under opposite circumstances. In the first case, the ascites is *active* or *sthenic*, and may be the result of peritonitis; in the latter, it is *passive* or *asthenic.* The particular pathological condition must be discriminated by the accompanying symptoms. At times, we may have a difficulty in deciding as to its precise character; but if one case be accompanied by more or less febrile excitement, and another by evidences of the scorbutic or hemorrhagic diathesis, no obscurity can exist.

Visceral disease is perhaps the most common of the causes of ascites; and frequently the effusion is owing to a mechanical impediment to the abdominal circulation; as where ascites occurs in one, who has been long habituated to over-indulgence in spirituous potations. The liver becomes softened, indurated, hypertrophied, or so diseased, that the blood of the portal system cannot circulate freely through it; engorgement of the abdominal venous system consequently supervenes, and transudation or increased secretion of the more watery parts of the blood takes place into the cavity of the peritoneum. Irregularity of circulation is likewise induced by the enlargement of the spleen, so often observed as a sequel of intermittent fever; by granular disease of the kidney, and by diseases of the great central organ of the circulation. These are, of course, the most difficult of removal. At times, the loss of balance takes place without any adequate cause; sometimes after a debauch.

When the disease is dependent upon serious mischief in other organs, the prognosis of the dropsy merges in that of those affections, and as they often occur in persons of broken down constitutions, the issue will probably be unfavourable; and this is the cause, why the dropsical cases, that present themselves in our almshouses, are generally so unmanageable. The abstraction of the fluid by a surgical operation can be regarded only as palliative, and the individual gradually sinks, worn out by the excessive secretion at the expense of the system, and the consequent irritative excitement. Commonly, stupor, and signs

of cerebral oppression are the precursors of the fatal termination, which may be owing either to hypercrinia of the fluid of the arachnoid, or to the encephalic exhaustion.

Pathological Characters.—The fluid of ascites is, as a general rule, transparent and colourless; but occasionally it is tinged yellow or green. In that drawn by tapping from a woman labouring under ascites, combined with symptoms of Bright's disease of the kidney, Sir Robert Kane, of Dublin, detected urea in large quantity. Where the fluid has long bathed the viscera, they exhibit the same appearance as if they had been immersed in fluid out of the body; and, in some cases, the tissues of the liver, spleen and intestines, seem as if they had been macerated. If the solid viscera be diseased, the evidences thereof will be apparent.

Treatment.—The treatment of ascites rests upon the same principles as that of general dropsy. Great reliance must be placed upon bloodletting, if the disease be active, with brisk cathartics, diuretics, local revulsives, and methodical compression to the abdomen by means of an appropriate bandage. Careful examination must be made to discover the pathological cause, and if this should appear to consist in disease of one of the solid viscera, the treatment must be directed to the removal of the cause, after which the effect may cease. Unless, however, the kidneys themselves be diseased, diuretics will generally, if not always, be proper.

The dropsies, which are such common attendants or sequelæ of intermittent fever, are often effectually removed by the sulphate of quinia, or by the subcarbonate of iron in large doses. Occasionally, it would seem, after a large blister has been applied over the abdomen, an astonishing secretion of fluid has taken place from it; and the ascites has disappeared. Two such cases are referred to by Dr. Chapman,—one which he himself saw,—the other reported by Dr. Caldwell, of Louisville.

Whenever the distension becomes so great as to interfere materially with the breathing, and to cause excessive abdominal distension and uneasiness, the operation of paracentesis is indicated. As before observed, it can only be regarded as a palliative in any case; but it occasionally affords a chance for the successful employment of appropriate anti-hydropics afterwards. Such a beneficial result can, however, be anticipated in those cases only, which are of an uncomplicated kind, or which have resulted from peritonitis. When the disease owes its origin to lesions of the heart, liver, spleen, or kidney, the relief can only be temporary. Often, indeed, the patient sinks rapidly after the fluid has been withdrawn; generally from systemic irritation, as in cases where large quantities of purulent matter have been evacuated; but at times, owing to resulting peritonitis. Dr. Prichard, of Bristol, England, uses a needle with a larger groove than the common exploring needle, (see Empyema,) with which he has evacuated the fluid with perfect ease and safety, and with the advantage, that the pain attending the operation is so very trifling, that the patient will call occasionally for a repetition of it, after having once experienced the relief that follows its use. He recommends that both in ascites and

hydrothorax it should be used much earlier than the trocar is generally advised, the practice of deferring paracentesis until all other means have been long tried being, in his opinion, a principal cause of the frequent return of the effusion. Dr. Babington employs a very small trocar and canula, which, together, are not thicker than an ordinary grooved needle. The instrument is provided with a probe to pass through the canula.

From a fancied, but loose, analogy with hydrocele, the apparently rash practice has been proposed of introducing the vapour of wine and other stimulants or astringents into the cavity of the peritoneum. Peritonitis—it is presumable,—would generally follow; and the patient, who has submitted to the operation of paracentesis for ascites, which is rarely practised except in advanced cases, is little able to bear irritation of any kind. Still, cases are on record, where iodine injections have been used repeatedly without any bad results, and apparently with the effect of removing the disease. Where the dropsy is encysted, their employment would, of course, be less hazardous. See Dropsy of the Ovary.

After the operation of paracentesis, opportunity is afforded for examining into the condition of the abdominal viscera, and every effort should be made, by appropriate revulsion, to prevent a re-accumulation of the fluid. Great advantage has accrued, in such cases, from change of air, as from one of the crowded cities to a watering place; where the individual can experience a thorough mutation of all the influences surrounding him. The sulphur waters of the Virginia Springs, taken in moderation, have, along with the influences just mentioned, exerted a salutary agency, by exciting the action of the kidneys and the bowels; but caution is necessary that they be not taken too freely.

CHAPTER VI.

MORBID PRODUCTIONS IN THE PERITONEUM AND INTESTINES.

Various morbid productions occur in the peritoneum and intestines, besides those that have been already described.

a. *Tubercles.*—These are met with in the peritoneum—*Cæliophymata, Tubercula peritonæi;* Fr. *Tubercules du péritoine, Péritonistrumosie,* of M. Piorry; Ger. *Bauchfelltuberkel,*—sometimes accompanied by inflammation, and at others not. They are in the form of granulations, more or less thickly dispersed over various parts. When they accompany peritonitis, they may be suspected from the tubercular diathesis of the individual. From a comparison of 358 cases, of which 127 were those who had died of phthisis, and 40 from other diseases, it was inferred, by M. Louis, that tubercles never occur in any organ in the body, after the age of 15, except in cases in which they also exist in the lungs. Yet, they may be present to a great extent in the peritoneum, without any being found in the lungs. In a case of peritonitis with tubercles, already referred to, the surface of the intestine, as well as the omentum and peritoneum, was thickly studded with tubercles, varying in size from a pin's head, to a small pea, but the tubercles were by no means numerous in either lung. Tubercles—*Tubercula intestinorum, Enterophymata;* Fr. *Tubercules des intestins;* Ger. *Darmtuberkel,* are likewise found in the intestinal canal, and most commonly towards the termination of the small intestine. They may exist without giving any evidence of their presence, or they may cause, or be accompanied by, symptoms resembling those of chronic enteritis.

b. *Melanosis.*—We have elsewhere spoken of melanosis having been met with in chronic peritonitis. The parts of the peritoneum, in which it is mostly observed, are the greater omentum and the epiploic appendages of the colon. At times, a nodulated variety is seen, the tumours, whether isolated or agglomerated, being generally adherent by small pedicles, and enveloped in cysts of fine cellular tissue, often furnished with delicate vessels.

c. *Fibrous, steatomatous, lipomatous,* and *encephaloid tumours.*—Extremely large fibrous tumours sometimes form on, or rather under, the peritoneum, and occasionally augment so much as to fill the abdomen. An interesting case of the kind, connected with the peritoneal covering of the uterus, fell under the author's care, and subsequently under that of his colleague in the Philadelphia Hospital, Dr. Pennock, who has given a description of it accompanied by a drawing. (The author's *American Medical Intelligencer,* Aug. 1, 1839.) Steatomatous and lipomatous tumours are rarely met with. It has been

asserted, indeed, by M. Andral, that it is not very uncommon to see lipomata which have formed in the parietes of the intestines, without occasioning any disorder during life; but this is not the result of the author's observations.

All these tumours, as well as encephalosis, when they are of any size, manifest themselves, by a swelling, which is perceptible on examination; but they are devoid of pain; are little sensible to pressure, and at first not marked by general symptoms; until they interfere with the abdominal circulation, and excite visceral irritation, under which the patient may succumb. The author attended with a respectable physician of Baltimore, Dr. Pue, a case of encephalosis in a child, which almost filled the cavity of the abdomen. Its contents were distinctly encephaloid in some parts; in others, it contained a grumous fluid, of the general consistence of thin jelly; and, in others, a purulent secretion. A similar case is related by Professor Gross, of Louisville.

CHAPTER VII.

INFLAMMATION OF THE CELLULAR TISSUE IN THE ABDOMEN.

Every portion of the cellular membrane of the cavity of the abdomen—as elsewhere—is liable to inflammation; but, as remarked by M. Grisolle, that which surrounds the kidney, is contained in the iliac fossæ, and in the cavity of the pelvis in larger quantity than elsewhere, is most subject to it.

I. INFLAMMATION OF THE CELLULAR TISSUE SURROUNDING THE KIDNEY.

Synon. Perinephritis; *Fr.* Périnéphrite, Phlegmon périnéphrétique.

Diagnosis.—Inflammation of the cellular tissue around the kidney is announced by deep-seated pain in the lumbar region, augmented by pressure, or percussion, or by moving the body. This is soon followed by tumefaction; whilst the secretion of urine may be wholly unaffected. Along with these local signs, the ordinary phenomena of internal inflammation are present; and the stomach and bowels may be more or less implicated,—as evinced by nausea, vomiting, and constipation. In the course of a few days, the symptoms augment; the pain becomes more lancinating, and afterwards obtuse; the tumour of the loins increases, and becomes œdematous; and, at length, fluctuation may be detected by careful examination. The pus may ultimately escape through the posterior part of the parietes of the abdomen; or it may pass into the colon or ureter, or, proceeding down into the iliac fossa, may present itself in the flank or groin. Cases, too, have been met with in which the pus had made its way through the diaphragm and lung, and been discharged by expectoration.

When the inflammation is caused by the escape of fæces or urine, owing to disease of the colon or of the kidney, which may have been indicated by appropriate phenomena, disease proceeds much more rapidly than when it occurs spontaneously and is much more diffused. Gangrene, under such circumstances, generally results, and on pressing over the tumour crepitation is observed, owing to the infiltration of air into the cellular tissue. The author has observed, however, two cases recently, in which crepitation was felt along with vivid inflammation of the skin and subjacent cellular tissue, without the supervention of gangrene. M. Grisolle affirms, that mortification, under such circumstances, will speedily invade the skin unless the progress of the septic infiltration be arrested by numerous incisions; yet in neither of the two cases did mortification ensue, although no incisions were practised.

Along with these phenomena, the patient presents all those that characterize a general ataxic and adynamic condition; under which he often gradually sinks.

When the abscess opens externally, the character of the pus will

not always indicate the precise visceral changes that have occurred. Frequently, for example, according to M. Grisolle, it exhales a stercoraceous odour, although there may be no communication between the abscess and the colon. He affirms, too, that the abscess may communicate with the pelvis or the calices, when the pus will have a urinous odour.

Causes.—This inflammation does not seem to occur often spontaneously. It is sometimes induced by violent nephritis extending to the cellular tissue around, or by the rupture of an abscess of, the kidney. Infiltration of urine may also be caused by wounds implicating the pelvis or calices of the kidney, or by their being perforated by calculi. Perforation of the colon may induce the same result.

Pathological Characters.—The cellular tissue beneath the peritoneum lining the posterior part of the abdomen is found infiltrated with pus, and at times gangrenous; and that which is contained between the quadratus lumborum muscle and its aponeurosis may be swollen, softened, and destroyed by the suppuration. The muscular fibres themselves may be bluish, discoloured, softened or destroyed; and the subcutaneous cellular tissue of the loins may be infiltrated with pus, coagulable lymph, a yellow-coloured serum, or may be gangrenous.

Treatment.—This must be decidedly antiphlogistic in the first instance, and consist of general and local bleeding; with warm cataplasms—moist or dry—to the affected region; and full doses of opium to allay pain and produce sedation. As soon as fluctuation is distinctly perceptible, an opening should be made to give issue to the pus; and when there is reason to believe, that the purulent collection is owing to perforation of the colon or of the pelvis of the kidney, on account of the gangrene and disorders occasioned by the urine and fæcal matters effused into the cellular tissue, M. Grisolle states, that the manifestation of fluctuation ought not to be waited for; and that large incisions should be made to give issue to the septic matters, which infiltrate the soft parts. It can rarely or never happen, however, that such incisions can save the patient; whilst the difficulty must be extreme in deciding positively, that the purulent collection is dependent upon such perforation.

II. INFLAMMATION OF THE ILIAC FOSSÆ.

Synon. Inflammatio Fossæ Iliacæ, Phlegmone Fossæ Iliacæ; *Fr.* Phlegmon de la Fosse Iliaque.

This affection is but little described by medical writers. According to M. Grisolle, M. Dance first directed attention to it; and M. Grisolle himself has published a memoir upon the subject, which he has epitomized, with the additions suggested by subsequent experience, in his *Traité élémentaire et pratique de Pathologie Interne*, Paris, 1844.

Diagnosis.—The first uneasy sensation experienced by the patient is a more or less acute pain, augmented by pressure, or by moving the body or the limb of the same side, which cannot be completely extended without intense suffering. The pain, which is commonly seated in the iliac fossa, but at times in the hypogastrium, is

acute, lancinating, continued and exacerbating. Occasionally, however, it is rather an inconvenient feeling of dull heavy pain or numbness (*ongourdissement*). Frequently, the pain shoots towards the genital organs and the limb of the same side, owing most commonly to the disease implicating the nerves that proceed towards those parts. For the same reason, numbness and formication are experienced in the limb. If pressure be made over the iliac region, some deep-seated tumefaction may generally be detected, which is painful upon pressure; but if the inflammation has extended to the peritoneum, so much pain may be experienced, that no tactile exploration can be permitted. Owing, perhaps, to obstruction to the return of blood through the iliac vessels, infiltration takes place into the cellular membrane of the limb. This M. Grisolle has noted in a quarter of observed cases. In three fourths of the cases, constipation existed, which he ascribes to pressure exerted upon the intestine, especially when the affection was on the right side. Meteorism is also not uncommon, and the patient experiences marked relief from the discharge of flatus, especially when it takes place downwards. From the commencement of the disease, however, the digestive function is sympathetically affected, and constipation or diarrhœa, with nausea and vomiting, are usual concomitants. There is always, also, more or less fever, as in other internal inflammations.

In almost all cases, the inflammation terminates by suppuration, which may be indicated by the ordinary general phenomena, and after a time may be detected by local evidences. It takes place slowly; and the same is the case when it ends by resolution, so that even in the most favourable cases health is long in being re-established. At times, the pus makes its way outwards through the anterior parietes of the abdomen, near the crista ilii; less frequently, it is discharged into the cæcum or sigmoid flexure of the colon. At other times, it travels into the pelvis, and empties itself through the rectum, or bladder, and most frequently, in the female, into the vagina. M. Grisolle refers to a case noted by M. Demaux, in which an iliac abscess broke into the vena cava; and to one published by M. Aubry, of an iliac abscess, in the puerperal state, which opened both externally and into the acetabulum so as to occasion a luxation of the hip.

When the disease soon terminates fatally, it may be in part owing to peritonitis induced by the extension of the inflammation, or by the rupture of the abscess into the peritoneal cavity.

The disease is always dangerous; and when it occurs after delivery is considered by M. Grisolle to be more so than usual. Its issue is almost always unfavourable.

Causes.—Inflammation of the cellular membrane of the iliac fossæ is, according to M. Grisolle, five times more frequent on the right side than on the left; but the opposite he affirms to be the fact in the cases that occur in females after confinement, without there being any manifest reason for the difference. Excepting under such circumstances, men are incomparably more frequently attacked by it than women. It is observed more commonly between the ages of 20 and 40: the author has recently seen a fatal case at the age of 78. The disease

has been supposed to be frequently owing to prolonged constipation, or to extension of inflammation from the cæcum to the cellular tissue —*perityphlitis;* but M. Grisolle thinks that this has not been sufficiently demonstrated. It doubtless, however, may be produced in this manner, as well as by the extension of peritonitis.

Pathological Characters.—As the disease does not usually prove fatal until after suppuration has been established for some time, purulent matter may be met with in the iliac fossa, behind the cæcum, and even as high up as the kidneys and false ribs. In a recent interesting case, it was contained, in considerable quantity, as high up as the liver. The parts bathed in the matter are blackish, and not regularly circumscribed. The psoas, iliacus and quadratus lumborum muscles may be healthy; but most frequently they are more or less affected, being dark-coloured, infiltrated with pus, and their fibres softened or destroyed; and at times the destruction is so great, that the fascia iliaca itself is destroyed, so that scarcely a vestige remains. The purulent collection is crossed by the nerves proceeding to the lower extremity, which may be uninjured, but generally they are softened. Such are the essential appearances. Occasionally, however, as in a case referred to above, purulent infiltration is found in other parts,—in the cavity of the pelvis, as well as between the peritoneum and the muscles of the abdominal parietes; and the inflammation may be propagated to the groin and thigh of the corresponding side, which may become greatly swollen and inflamed; and an infiltration of coagulable lymph or of pus may take place into the subcutaneous cellular tissue, as well as into that between the muscles.

Treatment.—This must be essentially the same as that required in Inflammation of the Cellular Tissue surrounding the Kidney. When pus has formed, M. Dance recommended that we should await its spontaneous evacuation by the bowels. M. Grisolle, however, advises that an artificial issue for it should be practised through the parietes of the abdomen. Doubtless, where this can be accomplished with safety, it ought to be; but, as M. Grisolle has properly remarked, it ought not to be attempted until fluctuation is manifest, and there is a certainty that union has been established between the purulent *foyer* and the abdominal parietes. Percussion, too, should be carefully practised over the point at which the incision is proposed to be made, in order that the practitioner may be satisfied there is no intervening fold of intestine which may be injured by the instrument. Should the matter be so deeply seated that it cannot be reached, the application of issues or moxas has been advised; but these can only add to the sufferings of the patient, which ought to be allayed by full doses of opiates,—waiting the result, which will generally be hectic and death.

III. INFLAMMATION OF THE PSOAS AND INTERNAL ILIAC MUSCLES.

Synon. Inflammatio Musculi Psoas et Iliaci Interni, Lumbago Inflammatoria Psoadica, Psoitis; *Fr.* Inflammation des Muscles Psoas et Iliaque Interne, Psoite; *Ger.* Entzündung des Psoas Muskels, E. des Lendenmuskels.

This disease may properly receive attention here, as it is less perhaps an inflammation of the muscle—*Myitis, Myositis, Rheumatismus*

phlegmonodes, Myodynia inflammatoria, Phlegmasia myoïca, Inflammatio seu Phlegmone Musculorum; Fr. *Myosite, Inflammation des Muscles;* Ger. *Muskelentzündung*—than of the cellular tissue surrounding them, and the fasciculi of which they are composed. It has been indeed doubted by many pathologists, whether the muscular fibres themselves are ever inflamed; and certainly the affection is uncommon.

Diagnosis.—The functional phenomena are strikingly like those of inflammation and abscess of the iliac fossæ. Commonly, however, there is more pain in the lumbar region, which shoots into the iliac fossa and the thigh of the side affected. The limb of this side is drawn up more or less, and it is difficult, if not impracticable, to extend it; and the foot is turned inwards. Such is the general description; but M. Grisolle affirms, that in several cases observed by him, neither the retraction of the limb and the impracticability of extending it, nor pain and shootings in the loins, are constant symptoms of suppuration of the psoas; for he has seen them wanting in several cases in which the muscle was completely destroyed. It must be difficult, therefore, to distinguish between abscess of the psoas and iliac muscles, and abscess of the iliac fossa implicating the same iliac muscles without affecting the psoas. In process of time, a fluctuating tumour is observed either at the fold of the groin or in the lumbar region; which is sooner or later discharged either spontaneously or by art, after which hectic generally supervenes, and the patient dies of marasmus.

Causes.—The disease may arise spontaneously, or it may be caused by scrofulous caries of the vertebræ, or by falls. The pus that forms then makes its way under the sheath of the muscle, and appears at the groin. It appears to be induced chiefly at the latter periods of pregnancy in the female, when it does not depend on caries of the vertebræ.

Pathological Characters.—Pus may be formed under the sheath and between the fasciculi of the psoas, and of the iliacus internus, where the latter is implicated,—occasioning atrophy or destruction of the muscular fibres, which appear in the purulent fluid under the form of a dark-coloured detritus; or they may be distinguishable, but of a darker colour than usual, and softened. The suppuration is rarely confined to the psoas, but implicates the iliacus, and the subperitoneal cellular tissue.

The treatment must be essentially the same as that inculcated under Inflammation of the Cellular Tissue of the Iliac Fossæ.

III. INFLAMMATION OF THE CELLULAR TISSUE IN THE PELVIS.

Fr. Phlegmon de l'Excavation Pelvienne.

When purulent collections form in the pelvis, they are generally the consequence of infiltration of urine or escape of fæces in man, or to some operation, as lithotomy, performed on the bladder. In the female, they may be dependent upon some uterine affection, occurring especially as a consequence of parturition, when they are seated in the broad ligaments or in the recto-vaginal septum: at times, also, as a consequence of the application of the forceps, an extensive purulent infiltration takes place into the cavity of the pelvis.

Diagnosis.—More or less pain is always experienced, which is re-

ferred to the cavity of the pelvis. It is generally, too, augmented by pressure on the hypogastric region, and in the female by an examination by the rectum, or vagina, or by both. This is necessary where the phlegmon is seated in the recto-vaginal septum. If the index finger be introduced into the rectum, and the thumb into the vagina, and the perineum be pressed upwards by the hand between the finger and thumb—or what is termed the first interdigital space, the tumour may be embraced at its lower part; and, as MM. Bourdon and Grisolle have advised, if percussion be made alternately with the finger and thumb, whilst one or the other is firmly applied to the opposite side of the tumour, fluctuation may be perceptible. There is generally a sense of weight, tension, and bearing down, which is greatly increased in the upright position and during defecation. The parts, too, are exquisitely sensible to the touch, and the tumour is hard and tense.

The constitutional symptoms are the same as those that accompany inflammation of the cellular tissue in the abdomen.

Treatment.—The treatment in the early period must be antiphlogistic; and whenever fluctuation is perceptible, the abscess must be punctured at its lowest part.

BOOK II.

DISEASES OF THE RESPIRATORY ORGANS.

The diseases of the air passages are of great interest to the therapeutist. The delicate organization of the lungs, their state of constant activity, and their being exposed to the contact of air of different barometrical, thermometrical, and hygrometrical conditions, which contains various extraneous matters suspended in it, render them especially liable to diseases, and those of a most serious character. It has been affirmed by Dr. C. J. B. Williams, that thoracic diseases constitute, in England, nearly one-half of the fatal cases, and perhaps quite one-half of the slighter disorders; and many other diseases, both local and general, owe their serious or fatal character to secondary thoracic lesions. This, however, is too large a proportion. In the third Report of the Registrar-General, (1841,) it would appear, that in 1839, the deaths from diseases of the respiratory organs, throughout England and Wales, amounted to 90,565 persons, comprising 27 per cent. of the whole number of deaths. This is nearly the proportion in New York. According to Dr. Griscom, City Inspector, the whole number of deaths, in the year 1842, exclusive of premature and still births, was 8475; the number of deaths from the diseases of the respiratory organs, 2242; being about 26½ per cent. of the whole number.

Important as those diseases are, their diagnosis was in an extremely imperfect state prior to the present century. Before this, indeed, attention, as will be seen, was paid to the physical signs afforded by listening to the sounds rendered on percussing the thorax; but still, it is to Laënnec, that we are indebted for the introduction of the main improvements in the detection of thoracic diseases by audible evidences, in which he has been ably supported by many living observers.

To facilitate the understanding of the various diseases, which fall under consideration in this section, it will be requisite, as in other cases, to make a few preliminary observations on the anatomy and physiology of the apparatus; and likewise on the principles and adaptation of the different plans, which have been devised for accurately appreciating the physical signs of the different lesions.

I. ANATOMICAL AND PHYSIOLOGICAL CONSIDERATIONS.

The respiratory organs consist of the larynx, the trachea, the bronchia, and the lungs; but besides these there are accessory organs, which require mention.

The larynx is bounded anatomically, from above to below, by the epiglottis and the inferior ligaments of the glottis, in which voice is produced; and it is lined internally by a mucous membrane, which is a prolongation of that of the pharynx. On examining the interior of the larynx, two clefts are perceptible, one above the other; these are formed respectively by the superior and the inferior ligaments of the glottis; and, between them, are the ventricles of the larynx. The inferior ligaments of the glottis meet at a point behind the thyroid cartilage, which causes the projection in the neck,—the *pomum Adami*,—so as to form a triangular cleft—the glottis or *rima glottidis*, the posterior extremities of which are attached to the arytenoid cartilages; the cleft being diminished or enlarged by the contraction or relaxation of the arytenoid muscles, which pass from one arytenoid cartilage to the other. The thyro-arytenoidei muscles form, with the ligamentous structure and mucous membrane, the lips of the glottis or inferior ligaments. These muscles have usually been esteemed dilators of the glottis.

The intrinsic muscles of the larynx receive their nervous supply from the pneumogastric nerves. Shortly after the pneumogastric issues from the cranium, it gives off the *superior laryngeal*, which is distributed to the muscles that close the glottis; and after it has entered the thorax, it gives off a second branch, which ascends towards the larynx, and is hence called the *recurrent* or *inferior laryngeal*. It is distributed, in part, to the thyro-arytenoidei muscles,—no ramification, according to some, going to the arytenoidei muscles. Others, however, maintain, that these last muscles receive a filament from each of the inferior laryngeals. This difference of sentiment envelopes the precise functions of these different branches of the same great nerve—the pneumogastric—in obscurity. If the superior laryngeal had been distributed solely to the contractor muscles of the glottis, whilst the inferior laryngeal was distributed to the dilators solely, the anatomical evidence would have been strong, that the former are concerned in the dilatation, and the latter in the contraction of that aperture. Experiments have shown, that if both the recurrents and the superior laryngeal nerves be divided, complete aphonia is the result; and it can be readily understood, that if either of these important branches be injured, the voice may be affected; but much remains to be learned regarding their exact functions.

Whenever any irritating substance reaches the larynx, it is at once closed by means of its contractor muscles. The action in this case, is clearly *excito-motory*—in other words, the irritation is conveyed with the rapidity of lightning along a sensitive nerve to the great nervous centres, and, with the like rapidity, the appropriate muscles are excited through a motor nerve. To this we have analogous phenomena in coughing and sneezing. In the case, above mentioned, of the clo-

sure of the glottis under irritation, it has been believed, that the superior laryngeal is the sensitive, and the inferior laryngeal the motor nerve. (See on the subject of the nerves of the larynx, the author's *Human Physiology*, 6th edit. vol. i. p. 421, Philad. 1846.)

Every part of the larynx, with the exception of the inferior ligaments, may be destroyed, and yet the voice may continue; and when the larynx is exposed in a living animal, the inferior ligaments are distinctly observed to vibrate, whilst the superior appear to be unconcerned. The former, are, consequently, the great organs by which voice is produced, although for its perfection the superior ligaments and the ventricles may be requisite.

It can be readily understood, that any morbid state, which modifies the condition of the lips of the glottis, as inflammation, ulceration, or œdema; or that interferes with the action of the intrinsic muscles, will modify the character of the voice; and that, if the lesion be considerable, it may induce total loss of voice—complete aphonia. As the intensity of the voice is dependent upon the force with which the air can be sent from the lungs, it will of course vary, according to the condition of those organs, and the general powers of the system.

The trachea is continuous with the larynx, and is lined by a continuation of the same mucous membrane. It divides into two large tubes—the *bronchia*—one of which goes to each lung, and these, after numerous subdivisions, become imperceptible in the lung. They are lined by a continuation of the laryngeal mucous membrane; and it is probable, that what are called the air cells of the lungs are only the blind extremities of myriads of bronchial tubes. Whether the mucous membrane proceeds as far as the ultimate radicles is a point that cannot be determined.

In the trachea and larger bronchial tubes, the cartilages do not form an entire circuit:—in the trachea especially, an obvious muscular structure exists in the posterior third, where the cartilages are wanting. The use of these muscular fibres, doubtless, is to diminish the calibre of the tube by their contraction, so that the air, being driven more rapidly through a narrower space, may more readily sweep away from the mucous membrane the matter of expectoration. These fibres cannot be detected in the smaller bronchial subdivisions, but many of the phenomena of asthma would seem to establish their existence.

The position of the lungs at the sides of the chest and that of the heart must be borne in mind by the investigator of thoracic disease. It has been just remarked, that the air-cells—as they are termed—are probably but the minute terminations of the different bronchia. Each of these is associated with a radicle of the pulmonary artery, and of the pulmonary veins; and, in addition to these organic constituents, the lung has arteries—the bronchial—for its nutrition, with corresponding veins, and lymphatics. The nerves are from the pneumogastric, and the ganglionic. All these elements are bound together by interlobular cellular tissue, so as to constitute the lungs as we observe them when cut into.

Each lung has a proper fibrous capsule, and it is covered by the serous membrane—the pleura—in such manner, that there are two

pleuræ, each of which is confined to its own half of the thorax, lining the cavity and covering the lung. Where the two pleuræ approximate each other behind the sternum is the *mediastinum*, in which the heart is situate. As each pleura is reflected over the lung—*pleura pulmonalis*—and lines the parietes of the thorax—*pleura costalis*;—when the lungs are distended with air, the two must be brought into contact. To prevent friction, a serous fluid constantly lubricates them in health; but, if this is arrested from any cause, and morbid productions are formed on the pleura, the sound of friction becomes at times distinctly audible.

No air is contained in the cavity of the pleura, as was at one time believed.

In ordinary inspiration, when the ribs are raised by the appropriate muscles, the pleura costalis is, of course, raised at the same time; and, hence, pain is experienced during inspiration when the pleura is inflamed. The pleura costalis and the pleura pulmonalis frequently, too, unite under such circumstances, and this is usually the case in phthisis pulmonalis, so that the affected side does not rise in inspiration like the other; and the same result occurs, if, owing to consolidation, the lung of one side is unable to receive its proper quantity of air. Whilst the ribs are raised in inspiration, the diaphragm is depressed; and, in cases of pleuritis, respiration is almost wholly effected in this manner, to avoid the pain consequent on the elevation of the ribs. For the like reason, relief is obtained by tying a handkerchief firmly round the thorax. On the other hand, in cases of hepatitis, as the depression of the diaphragm cannot fail to add to the suffering, the breathing is almost entirely costal. During expiration, the muscles, concerned in inspiration, are relaxed; and, in full expiration, various muscles, that draw down the ribs, are thrown into action, which are aided by the active resiliency of the lungs themselves.

The quantity of air, capable of being inspired and expired, must depend upon the capacity of the lungs and the strength of the individual; so that it might seem important to test this at various periods of diseases, which involve the texture of the lungs, to enable us to infer as to the extent of lung impermeable to air; but the practical application of the method is environed with difficulties. It is always extremely distressing to the individual; and, as the powers of the patient simultaneously and progressively fail, there is less capability of full inspiration and expiration, and, indeed, of any effort,—so that the result, even if readily attained, would not be entitled to much consideration.

The number of inspirations is worthy of attention. This varies in different individuals. Eighteen may be regarded as an average. It varies according to age and sex. The child and the female breathe more rapidly than the adult male, and aged individuals appear to exceed the average. It must be borne in mind, however, that various circumstances, exercise, moral emotions, distension of the stomach from food, &c. &c., increase the number materially.

Thus much as regards the *mechanical phenomena* of respiration.—In diseases of the lungs, the *chemical phenomena* have, likewise, to be regarded. For plenary health, and even for existence, it is necessary

that air, containing one part of oxygen to four parts of azote, should be received into the lungs. The contact between air thus constituted, and the venous blood sent to the lungs by the pulmonary artery, is essential in order that hæmatosis—or the conversion of venous into arterial blood—may be accomplished. If such conversion do not occur at all, stasis of the blood—as will be seen under Asphyxia—takes place in the vessels of the lungs, and death. The atmospheric air passes with facility from the ultimate bronchial radicle into the minute pulmonary blood-vessel by imbition, and the refuse gases are readily exhaled through the coats of the blood-vessel and of the bronchium into the latter tube. The blood, at the same time, loses its venous, and assumes the arterial character.

Lastly;—the various respiratory phenomena—mechanical as well as chemical—are largely under the nervous influence. Experiments show, that the pneumogastric nerves contribute to the change of the venous into arterial blood, and that their division gives occasion to great dyspnœa, and death. When the phrenic nerves are tied, the most determined asthma is produced; breathing goes on by means of the intercostal muscles; the chest is elevated by them to the utmost; and, in expiration, it is as remarkably drawn in. The animals do not live an hour. The lungs in such case have appeared healthy, but the chest contained more than its natural exhalation. When the great sympathetic has been tied, but little effect was induced on the animal; but when the pneumogastric, phrenic, and great sympathetic were tied together, the animal lived little more than a quarter of an hour, and died of dyspnœa.

The pneumogastric and phrenic nerves form part of the *respiratory system of nerves* of Sir Charles Bell. This system is considered by Sir Charles to be distributed to the multitude of muscles, that are associated in the respiratory functions, in a voluntary or involuntary manner; and are especially concerned in forced or hurried respiration, coughing, sneezing, &c. As a distinct system this is by no means universally admitted by anatomists and physiologists. Many are of opinion, that there is no special column of the spinal marrow destined for respiration, and that there appears to be nothing so peculiar in the action of the respiratory muscles, as to require a distinct set of nerves.

II. PHYSICAL EXAMINATION OF THE CHEST.

By the *physical signs* of the healthy or diseased condition of the contents of the thorax, we mean the evidences that are afforded to the senses, uninfluenced by the vital properties of those contents; in contradistinction to *symptoms*, which are the evidences afforded by the living contents in action.

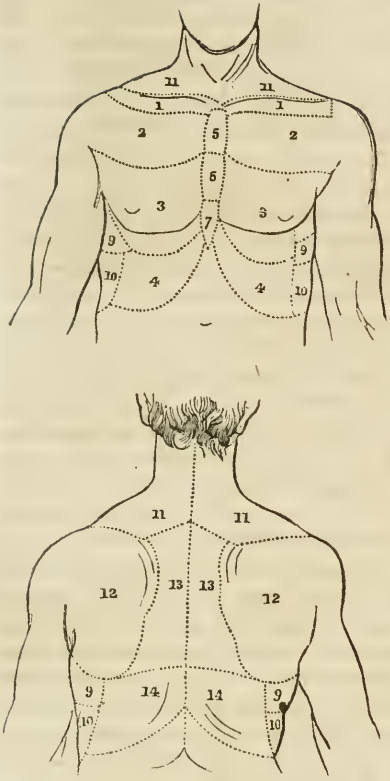
Surrounded, as the different viscera of the thorax are, by a bony framework, which prevents information from being obtained in the case of the deeper seated by any of the senses, the diseases of those viscera were comparatively obscure, before it occurred to Auenbrugger to employ percussion; and to the distinguished proposer of auscultation, to endeavour to detect their varying conditions by the sense of hearing. It is scarcely an exaggeration, indeed, to remark, with Dr. Marshall Hall, that, "the diseases of the respiratory system could

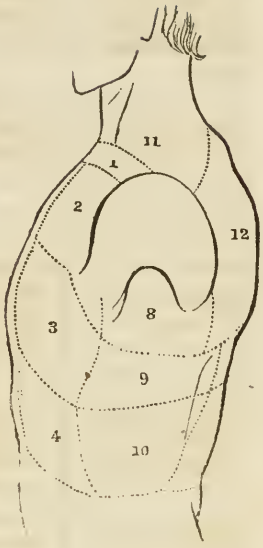
scarcely be said to be understood, until the era at which Laënnec's incomparable work appeared. The combination of auscultation and percussion constitutes the basis of the *diagnosis;* and the pathology is scarcely less indebted to that extraordinary man."

1. **Percussion.**—Percussion was introduced by Auenbrugger, of Vienna, in the year 1761; but it remained almost neglected for forty-seven years, when a translation of the work was made by Corvisart, which drew the attention of the profession to it. Its object, as a means of diagnosis, is to appreciate the sounds rendered by various parts of the chest, when struck, both in the healthy and the diseased condition. As the lungs always contain a large quantity of residuary air, and the parietes are possessed of a certain degree of elastic tension, if they be struck or percussed, a hollow and somewhat tympanitic sound or resonance is elicited, the intensity of which is diminished by whatever interferes with the elasticity of the parietes or by any adipous or other soft deposition, if in considerable quantity, in the integument. It will hence follow, that the resonance of the chest will be greatest over those parts, in which there is nothing but lung, and where the parietes are thinnest, and their tension greatest; and, on the other hand, if any disease have solidified the lung, so that it does not receive the air, or if any effusion have taken place within the chest, the resonance, instead of being hollow, as in health, will become dull; and, again, if the amount of air be augmented, as in pulmonary emphysema, the natural resonance may be largely increased.

The following tables, from Laënnec and Williams, will exhibit the sounds rendered by percussing the various regions in health. Where any solid viscus interferes—as the heart on the left side, or the liver on the right—the sound is, of course, more dull. The numbers correspond with those on the figures.

REGIONS.	SITUATION.	INTERNAL ORGANS.	SOUND OF PERCUSSION.
1. Clavicular, (Subclavian, Laënnec.)	Clavicles.	Apices of lungs.	Very clear towards the sternum; clear in the middle; dull, close to the humerus.
2. Infraclavicular or infraclavian, (anterior superior, Laënnec.)	Between the clavicles and 4th ribs.	Superior lobes of lungs; large bronchia near the sternum.	Very clear.
3. Mammary.	Between the 4th and 8th ribs.	Middle lobes of lungs; large bronchia in the upper part, near the sternum; the heart generally covered by the lungs in lower part of the region.	Very clear; in women, a clear sound only by mediate percussion.
4. Inframammary.	Between the 8th ribs and the margin of the cartilages of the false ribs.	The liver on the right, and the stomach on the left side, covered only on the upper part by the thin margin of the anterior inferior lobes of the lungs.	Dull on the right side; irregularly dull on the left, or unnaturally resonant.
5. Superior sternal.	Upper part of sternum.	Large bronchia.	Very clear.
6. Middle sternal.	Middle part of sternum.	Margins of middle lobes of lungs.	Very clear.
7. Inferior sternal.	Lower part of sternum and ensiform cartilage.	Above, margins of the lungs; below, the heart, liver, and sometimes the stomach.	In upper part clear; less so in fat persons; below, at times, more dull; at others, tympanitic.
8. Axillary.	In the axillæ, above the 4th ribs.	Upper part of the lateral lobes of the lungs.	Very clear.
9. Lateral (Inframammary.)	Between the 4th and 8th ribs at the sides.	Middle of the lateral lobes of the lungs.	Very clear.
10. Inferior lateral. (Inframammary.)	Below the 8th ribs, at the sides.	Margin of lateral lobes of lungs; the liver on right side, the stomach and spleen on the left.	Same as inframammary.
11. Acromial.	Between the clavicles and upper margin of the scapulæ.	Superior lobes of the lungs, and large bronchia.	Dull by direct percussion; a somewhat clear sound by mediate percussion, especially near the clavicle.
12. Scapular.	The scapulæ and muscular ridge below them.	Middle posterior lobes of the lungs.	The pectoral resonance can be elicited only by mediate percussion.
13. Interscapular.	Between the inner margins of the scapulæ.	The roots and inner parts of posterior lobes of the lungs.	Tolerably clear by mediate percussion, or when the arms are crossed, and the head bowed forwards: the spinous processes of the vertebræ sound well.
14. Infrascapular or inferior dorsal.	From the inferior angle of the scapula.	Base of the lung; the liver encroaches on the right, and the stomach on the left side.	Clear in the upper portion, by striking on the angles of the ribs, or by mediate percussion; below, often dull on the right, and unnaturally resonant on the left side.





An excellent "table exhibiting the physical cause and ordinary seat of the different physical signs, together with the names of the diseases in which they are observed," is given by Dr. Walshe, in his *Physical Diagnosis of Diseases of the Lungs*," Amer. Edit. Philadelphia, 1843.

Percussion may be *mediate* or *immediate;* that is, it may be made through some medium termed a pleximeter or plessimeter; or by the fingers themselves, the tips being placed on a level. Various *plexors* or *plessers* and *pleximeters* have been proposed. M. Piorry uses *first* a hammer as a plexor, the head of which is made of steel, brass, or iron; a capsule is screwed to the end, with a projecting disk of caoutchouc; the handle is made of wood, with depressions for the finger and thumb. The head of the handle is not placed exactly at right angles with the handle, but has a slight obliquity upwards, which is esteemed to be necessary, as in using it the handle is almost certain to be somewhat elevated, and this slight obliquity even then allows the practitioner to strike the pleximeter perpendicularly; and *secondly*, a *pleximeter*, made of ivory, wood or metal, with a handle at each extremity, to enable the practitioner to take hold of it more readily. Other instruments have been devised by Drs. Burne, Winterich, and C. J. B. Williams; but after all, for general purposes, the fingers of

the left hand, with their inner surfaces towards the chest, are the best pleximeter. They must be laid flat and transversely over the part to be percussed, and then struck with the tips of the fingers of the right hand, or with the stethoscope. The shirt may be drawn tightly over the part to be percussed; or percussion, where delicacy will permit, may be made over the exposed surfaces. The sounds rendered will be more distinct if the patient hold his mouth open whilst the chest is struck.

In all cases, percussion must be practised over the corresponding parts of both sides, and the results be compared. It may be effected, either when the individual is in the horizontal posture, or when erect. In the latter case, if the object be to examine the anterior part, the chest should be thrown forwards, by causing the patient to sit perfectly erect, with the head raised, and the arms carried backwards. To examine the posterior part, the head must be bent forwards, the spine slightly inclined forwards, and the arms crossed.

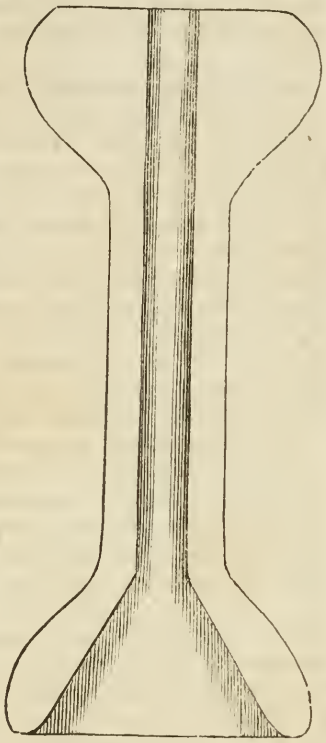
2. **Auscultation.**—Percussion is in reality a form of auscultation, but the latter term is commonly restricted to the audible evidences afforded by listening, either with the ear applied to the chest, or through an instrument called the *stethoscope*. In the former case, the auscultation is said to be *immediate;* in the latter, *mediate*.

The stethoscope is the invention of Laënnec; for although we have various forms, adapted for convenience or fancy, his original instrument was made upon principles that have been the guide to all subsequent inventors. It is a simple acoustic instrument, consisting of a cylinder with a tube running through it, which is funnel-shaped at one extremity, in order that the sonorous vibrations, that fall within it, may, after various reflections, as in the case of the common ear-trumpet, be concentrated and pass into the meatus auditorius. The sounds, produced in the thorax, can therefore be conveyed to the ear in two ways; first, by the solid parietes of the instrument, and secondly, by means of the air in its interior.

Any of the stethoscopes, offered for sale, will answer the purpose of the auscultator, provided the ear part can be easily adapted to his ear, and on this account he ought to select one that is suitable for him. It is proper, however, to observe, that the author has found those, which are wholly conical, or which, in other words, consist of the funnel part only, the least satisfactory, in consequence of the confusion of sounds, resembling, in some measure, those that are heard when a hollow shell is applied to the ear. The instrument should always have, in addition to the funnel-shaped portion, space enough for an inch or two of tube which is perfectly cylindrical, in order that, by the concentration of vibrations, this source of inconvenience may be obviated. The length of the original instrument of Laënnec rendered it inconvenient of application in many cases, and it was by no means easy to place the end of the instrument entirely flat on the chest, whilst the other was in apposition with the ear. Hence the author has for years employed an instrument almost identical with the one used by Dr. Billing, which is merely, as he remarks, Laënnec's abridged, and

is represented in the marginal figure. It may be about four inches long, and "may be obtained from any wood-turner for a few pence."

At a meeting of the British Association at Manchester, 1842, Dr. C. J. B. Williams presented a communication on the construction and application of instruments used in auscultation: in this, he states, that finding the considerable share which the solid walls of stethoscopes have in communicating sounds, and from experiment that their efficacy depends chiefly on the formation of the pectoral end by which they receive the vibrations, he had devised a form of instrument, which qualifies them better, he thinks, for this purpose, than any now in use. This consists in a bugle or trumpet end, the edges of which being made very thin, and applied flat on the walls of the chest, are most readily affected by their vibrations. An instrument, thus constructed, of a light rigid wood, such as sycamore, and tried with a test sound, will be found, according to Dr. Williams, superior for most purposes to the stethoscope hitherto used.



A flexible instrument, like the flexible ear-trumpet, has been devised, by which, without changing from one side of the patient to the other, the sounds of respiration may be heard with the same ear. It is better adapted for auscultating the heart and great vessels than the lungs. The author has frequently employed it, but he greatly prefers the ordinary instrument where the sounds require acuteness of hearing. Dr. Williams affirms, that when tried by a test sound, he has found it much inferior in conducting power for all the more delicate sounds of the breath and heart. "Louder sounds," he adds, "such as those of bronchial or cavernous breath, and voice sounds it exaggerates by the addition of a conchal echo, which renders it very difficult to distinguish them from each other." This objection has not, however, impressed the author.

It is scarcely necessary to say, that in order to understand the abnormous or unhealthy evidences afforded by auscultation, we ought to be familiar with the sounds rendered in health, and, hence, the young auscultator should experiment on the healthy subject, and especially on children, in whom some of the sounds are well developed. With this view, he may practise either *mediate* or *immediate* auscultation. The author is in the habit of employing the latter where circumstances will admit; but there are cases in which either delicacy,

or adaptation, or both, render the employment of the stethoscope indispensable.

When any part of the chest opposite the lungs is auscultated a murmur is heard, which has been called the *respiratory murmur, vesicular murmur, murmur of the expansion of the lungs, murmur of pulmonary expansion*, or *respiration of the cells.* The murmur is more marked during inspiration, and it is presumed to be owing to the gradual expansion and contraction of the vesicles of the lungs, and the friction of the air against them. This vesicular murmur is louder during infancy and early youth—hence termed *puerile*—and in females louder than in males. The respiratory murmur, is not the same in all persons of the same sex, nor in every part of the chest. Many persons have the respiration naturally very feeble, without any lesion of the lungs, whilst others have it very loud, and almost puerile. When the lungs are contiguous to the parietes of the chest, it is heard most distinctly—for example, in the axilla; in the space between the clavicle and the anterior edge of the trapezius muscle; the space between the clavicle and nipple, and between the spine and inner edge of the scapula. When the murmur is not heard distinctly in any of these places, and especially if not audible on one side, whilst it is distinctly so on the other, this is an evidence of disease. It is important, however, to bear in mind, that a difference of sentiment exists as to the inspiratory murmurs of the two sides under the clavicles, which are the common seat of tubercular formations. It has been asserted by one observer, Dr. Gerhard, of Philadelphia, and M. Grisolle accords with him, that "the bronchial respiration is decidedly more distinct in the right lung than the left, especially at the summit," and he accounts for it, by "the greater diameter and straighter course of the tubes, at the summit of the right lung, which are not lengthened and curved, as on the left side, by the presence of the arch of the aorta." On the other hand, another observer, M. Fournet, has satisfied himself, that in persons presenting all the characteristics of healthy lungs, the sounds of inspiration and expiration are precisely identical in all corresponding points: in the few persons in whom he detected a slightly greater developement of the expiration under the right than the left clavicle, there were some motives for a doubtful opinion respecting the state of the lungs. M. Fournet, indeed, thinks, from the physical condition of the two lungs, that there is no reason, why they should furnish different respiratory sounds. Again, another practised auscultator, Dr. Stokes, particularly dwells on the importance of the discovery made by him, that in many individuals, there is a natural difference between the intensity of the murmur in either lung, and in such cases, "with scarcely an exception, the murmur of the left is distinctly louder than that of the right lung." It would appear, consequently, and such is the result of the author's observation, that at times there is no marked difference between the two sides; that at others, and perhaps more frequently, the intensity of the inspiratory murmur is greater on the right side; and at others again, on the left.

According to M. Louis, the exaggeration of the vesicular murmur on the right side is more marked during expiration. In 22 females

who never experienced the slightest symptom of thoracic disease, the inspiratory murmur was absolutely the same under both clavicles; whilst the expiratory murmur, which was scarcely audible under the left clavicle in the majority of cases, 13 in 22, was in almost all cases, 17 in 22—manifest, and at times very prolonged under the right clavicle. When the same murmur was studied posteriorly, it was null on the left side in 14 cases, whilst on the right it was wanting in 5 only; and where the expiration was sensible on both sides, it was more marked and more prolonged, on the right than on the left side.

When we listen over the interscapular region, the respiration is more "blowing" or *soufflante*, as the French term it: this is owing to the bronchia at the root of the lungs being of considerable calibre. Of this *souffle* or "blowing sound," the trachea, in consequence of its size, affords an excellent type. When the sound is heard over the parts mentioned, it is an evidence of the healthy condition; but if it take the place of the respiratory murmur, it is a sign of disease; and denotes that the respiration is *tracheal* or *bronchial*, or, as it is more frequently termed, *tubal*—so called in consequence of the sound of respiration being formed altogether in the tubes.

If a large portion of the lungs be impervious to air, the act of respiration is of course accomplished by the remainder. The air, in such cases, passes in and out of the tubes with great energy and noise, and the respiration has been termed *supplementary*.

When the ear is placed over the chest, at its anterior inferior, or posterior inferior part, a gurgling noise (*gargouillement*) is sometimes heard, which must not be mistaken for the gurgling sound occasioned by purulent matter in the cavity. It is produced by the movements of the contents of the stomach or intestines.

Mention has been made before of the *friction* (*frottement*) of the pleura costalis with the pleura pulmonalis. This friction does not produce any distinct sound in health, but becomes well marked in certain cases of disease.

If the bronchial tubes be entirely free from disease, the sounds rendered will be of the kind described; but it will be readily understood, that if they be inflamed, or obstructed by mucus, pus, or blood, various sounds—*rhonchi*, *râles*, or *rattles*—will be heard, the character of which will be mentioned under the individual diseases. The following tabular view of the alterations of the respiratory murmur, is given by MM. Barth and Roger.

I. In its Intensity.		Respiration, strong. Respiration, feeble. Respiration, null.
II. In its Rhythm.	1. Frequency.	Respiration, frequent. Respiration, rare.
	2. Continuity.	Respiration, jerking (*saccadée.*)
	3. Duration.	Respiration, long. Respiration, short. Expiration, prolonged.
III. In its Characters.		Respiration, rude. Respiration, bronchial. Respiration, cavernous. Respiration, amphoric.
IV. By Abnormous Sounds.	First genus.	Friction sound.
	Second genus.	Rhonchi or *Râles.*

TABLE OF THE MAIN ABNORMOUS SOUNDS OF RESPIRATION, (*by the same Observers*).

- ABNORMOUS SOUNDS.
  - *First genus.* FRICTION SOUND. — Pleuritic friction.
  - *Second genus.* RHONCHI.
    - *First group.* Dry rhonchi *rhonchus.* (vibratory,) *Sonorous* — Sibilant, stertorous (*ronflant.*)
    - *Second group.* Humid rhonchi. (bullous.)
      - A. *Crepitant rhonchus.*
      - B. *Subcrepitant rhonchus.*
      - C. *Cavernous rhonchus.*

      — Fine subcrepitant, mean subcrepitant, subcrepitant with large bubbles.

Thus far, we have considered the auscultation of healthy respiration. The *voice*, likewise, affords physical signs of great moment. At present we shall speak of those only, that are heard in health, and which are the basis of all our diagnosis in disease.

When the voice is produced in the inferior ligaments of the larynx, the sonorous vibrations not only pass out by the vocal tube, but they proceed downwards along the trachea; and the resonance is distinctly heard when the ear or the stethoscope is applied to the chest. When the instrument is placed over the larynx or trachea at the time the individual speaks, the voice appears to pass immediately up to the ear of the auscultator, and is louder than that heard by the other ear. This phenomenon is termed the *laryngeal* or *tracheal voice*, *laryngophony* or *tracheophony*. It is the sound of health; but we meet with a similar physical sign in disease; the voice, when a cavity exists in the lungs, and is at the same time empty, seeming also to pass immediately through the stethoscope to the ear of the observer, and constituting the *cavernous voice* or *pectoriloquy*.

When the stethoscope is applied over the sternum and subjacent trachea; or between the spine and the scapulæ, in the middle of the back, over the subjacent large bronchial tubes, the voice is heard to resound very strongly; but it does not pass up to the ear, in adults, like the tracheal or laryngeal voice. In children, however, this *bronchial resonance*, *bronchial voice* or *bronchophony*, cannot be easily, if at all, distinguished from laryngophony.

It can be readily understood, that if any of the bronchial tubes be dilated, these sounds may become greatly developed.

This resonance of the voice can be felt by applying the hand to the chest. An obscure, diffused fremitus is perceptible, which has been called the *vocal* or *pectoral fremitus* or *vibration*. The author has found this manifestly augmented in cases of consolidation of the lungs—the difference between the sound and healthy side being often marked. Great discrepancy exists amongst observers as regards the true signification of the vocal fremitus, and its modifications in disease, as the following table from Dr. Walshe sufficiently exhibits.

NATURAL VOCAL FREMITUS.

	Increased.	Diminished.	Unaffected.
LAËNNEC, STOKES.		In consolidation and in effusion.	
REYNAUD. WILLIAMS, HOURMANN.	In consolidation.	In effusion.	
GRISOLLE.			In consolidation from pneumonia at least.
FOURNET.	Impossible in any case.	In all cases of density, whether of increase or decrease.	

In the minute ramifications of the bronchial tubes, the resonance of the voice is not heard; the vesicular texture of the lungs is a bad conductor of sound; and, consequently, it prevents the resonance of the voice in the bronchia from being transmitted to the parietes of the chest, excepting where bronchia of a certain size pass close to the surface. But if the vesicular structure be consolidated from any cause, —as by the formation of tubercles—then the bronchophony or bronchial resonance becomes very distinct, and aids us materially in our diagnosis. Such is the result of the author's observation, and it is that of almost all observers; yet, M. Fournet thinks, that it is impossible in any case, and that the natural vocal fremitus is diminished in all changes of density, whether of increase or decrease; and M. Skoda affirms, that increased resonance is owing to consonance or reciprocation,—a well-known acoustic phenomenon,—a view, which seems to be corroborated by the fact, that in pneumonia when there is hepatization of the lung, the resonance of the voice is sometimes distinct, and at others very indistinct. Dr. Walshe states, that he cannot help feeling, that there is something of importance yet to be discovered respecting this sign, which may furnish a ready clue to the contradictions in the statements of writers on the subject.

Again, if fluid exist in the chest, so as to modify the transmission of the vocal resonance to the ear of the auscultator, it may become a physical sign of disease,—as is presumed to be the case with *egophony* to be hereinafter mentioned. The following tabular view of the pathological phenomena of the voice and cough, more especially, is from MM. Barth and Roger.

I. PATHOLOGICAL PHENOMENA OF THE VOICE.

- Resonance, exaggerated.
- Bronchial voice or Bronchophony.
- Tremulous voice or Egophony.
- Cavernous voice or Pectoriloquy.
- Amphoric voice.

II. Pathological Phenomena of the Cough.	Bronchial or tubal cough. Cavernous cough. Amphoric cough.
III. Phenomena furnished by Respiration, Voice, and Cough.	Metallic tinkling.

It has been proposed to associate auscultation with percussion;—that is, to listen with the common stethoscope, or with one modified for the purpose, whilst a part is struck in the ordinary method of mediate percussion; and value has been assigned to *auscultatory percussion—acouophonia* or *cophonia*, thus practised; but it has not been much used, and is affirmed by M. Fournet to be deceptive—the perceived sound bearing no precise relation to the condensation or rarefaction of the subjacent parts. Hence it has been denounced—but in too strong language, by Dr. Walshe—as "obviously worse than worthless."

Another form of auscultation, proposed by M. Taupin, is that to which M. Hourmann gave the name *Autophonia, Relentissement Autophonique.* It consists in observing the character of the auscultator's own voice, when he speaks with his head in contact with the chest of the patient. The voice is said to be modified by the varying condition of the subjacent organs. Dr. Walshe states, that he has noticed, that the observer's voice acquires an egophonic character in cases of pleuritic effusion; but he doubts the certainty of the sign, and he thinks the only circumstances under which it could be really useful would be in the case of infants, as suggested by M. Hourmann himself. The author has practised it, with occasionally the same result in pleurisy as Dr. Walshe; but the sounds did not appear to him to be discriminative, and he therefore soon abandoned it. It may be used when the voice of the patient is so feeble as not to permit the existence of bronchophony to be tested.

3. Inspection, Succussion, Palpation, &c., of the Chest.—Lastly;—among the physical signs may be reckoned those afforded by *inspection of the chest*—the rising of the ribs, the extent of costal respiration, &c.; by *succussion* and *palpation*—to detect fluctuation; by *mensuration of the chest*—to discover the difference of capacity between the side of the chest which contains a lung more or less deprived of function from disease, and one which, in consequence of the morbid condition of its fellow, is perhaps executing more duty. All these methods will be referred to, where it may be necessary, under the particular diseases. It may be proper, however, to remark here, that the observations of M. Woillez have led him to infer, that a perfectly regular and symmetrical form of the chest, even in subjects who have never suffered from any pectoral disease, is rare, and does not exist in more than one of every five persons taken indiscriminately.

Such are the chief means for the physical exploration of the chest. It affords valuable evidence in regard to the nature and amount of organic disease,—more than any assemblage of general symptoms. Still, the physical signs can only be regarded as valuable adjuvants, and not to be trusted to alone. Certain organic affections of the chest afford nearly the same physical signs; but the general and special

symptoms indicate the difference. It has been asserted, indeed, that auscultation is of no practical utility; and there are still a few,—dwindled, it is true, to units,—who ridicule the whole doctrine of physical signs as worse than useless. The author has, thus far, known no one who understands and has practised this method, who does not esteem it as a valuable aid in diagnosis. It is troublesome, however, to acquire the knowledge, and, therefore, easier to decry its usefulness; as it is easier to decry productions of the press, which we have never perused, than to read them, and appreciate, by study, their usefulness. The stethoscope enables us to distinguish between diseases, whose general symptoms are alike; to pronounce on the existence of tuberculosis, and whether the tubercles have gone on to softening, when otherwise doubt might exist; and thus to encourage or to discourage —according to the evidence afforded—subjecting the patient to the inconveniences of a migration to another and more genial clime;—in the former case, enabling us to support the drooping spirits with well-founded expectations of benefit from the expatriation; and, in the latter, preventing all the unrequited misery and privation, which could not fail to attend upon so hopeless an expedition.

Unquestionably, too exclusive attention has often been directed to the study of the physical signs of thoracic disease. Dependent, moreover, as these signs are upon careful observation, it was to be expected, that unnecessary refinement might be introduced in the detail of the sounds afforded. These, it will be seen, have become extremely numerous; and many of the subdivisions so minute and needless, as to excite ridicule from those even who place great confidence in auscultation. "To tell the truth," observes a distinguished practitioner, M. Trousseau, "I have much greater pleasure in meeting with a man who will teach me the best mode of making a poultice, than with him who professes to instruct me in the differences between the *râle souflant* and the *râle sonore*, or how to distinguish the *râle sibilant* from the *soufflant râle*, or this latter from the *turturin râle*, or this again from the *roucoulant râle*, or the *caverneux* from the *cavernuleux râle*, and all such petty distinctions." "The greatest error that has been committed in regard to auscultation," says another auscultator, M. Raciborski, "is in having attached too exclusive importance to it, and in having esteemed it, as it were, a science of sounds (*bruits*,) each of which must indicate a different morbid condition. This much is certain,—and we are desirous of insisting upon it particularly,—there is no *râle* which has a very determinate and invariable value; and any one *râle* being given, it is almost impossible to tell, from it alone, the name of the disease to which it corresponds. I defy any one whatever to distinguish in all cases, with his eyes shut, and without interrogating the patient, the majority of cases of incipient tubercular pneumonia in the first degree, œdema of the lung, hæmoptysis, or even pulmonary emphysema. The sibilant rhonchus, or the bass-string rhonchus, does not indicate the existence of simple bronchitis more than of pulmonary emphysema or of tubercles, for they may both be heard equally in the three diseases. The bronchial *souffle* no more indicates hepatization of the pulmonary parenchyma than it proves the

existence of pleuritic effusion. The rhonchi even, which seem to belong more especially to a particular affection, have not such a determinate value as to enable us to pronounce positively the name of the disease when they are present. The gurgling, which is in some measure regarded as a pathognomonic sign of tuberculous cavities, may really be the result of pulmonary abscesses, or the effect of the dilatation of the bronchia; and the metallic tinkling itself may either be the result of pleurisy with effusion, of a pulmono-pleural fistula, or of a simple pulmonary excavation."

It is to be regretted, that many practitioners are accustomed to observe, or to listen, more than to reflect. As has been well remarked, it is the art of reasoning justly upon the physical signs rather than inquiring into the characters of the physical signs themselves, to which attention ought to be directed, and on which most observers fail. "It cannot be too often repeated," adds Dr. Stokes, "that physical signs only reveal mechanical conditions, which may proceed from the most different causes; and that the latter are to be determined by a process of reasoning on their connexion and succession, on their relation to time, and *their association with symptoms:* it is in this that the medical mind is seen. Without this power, I have no hesitation in saying, that it would be safer to wholly neglect the physical signs, and to trust, in practice, to symptoms alone."

CHAPTER I.

DISEASES OF THE LARYNX AND TRACHEA.

I. INFLAMMATION OF THE EPIGLOTTIS.

Synon. Epiglottitis, Inflammatio Epiglottidis, Angina Epiglottidea; *Fr.* Epiglottite, Inflammation de l'Epiglotte; *Ger.* Kehldeckelentzündung, Entzündung des Kehldeckels.

Inflammation of the epiglottis is considered by most to be midway between pharyngitis and laryngitis. The office of the organ is inservient to both deglutition and respiration, and, consequently, both functions participate in the disorder. The epiglottis is not as important an organ as was at one time supposed. It was formerly universally believed to be the sole agent in preventing substances from passing into the larynx. This, however, appears to be the combined effect of the motions of the larynx, by which it is drawn upwards during deglutition, and of the muscles whose office it is to close the glottis; so that, if the laryngeal and recurrent nerves be divided in an animal, and the epiglottis be left in a state of integrity, deglutition is rendered extremely difficult,—the principal cause that prevented the introduction of aliments into the glottis having been removed by the section. Cases have been related, of persons, who were devoid of epiglottis, and yet who swallowed without any difficulty. (The author's *Human Physiology*, 6th edit. vol. i. 528. Philada. 1846.)

Diagnosis.—It can rarely, or never, happen, that inflammation of the epiglottis occurs without symptoms denoting that other parts in the vicinity are implicated; and hence it is, that the disease has usually been described under Laryngitis or Pharyngitis. M. Dezeimeris, has collected several examples of this nature. In some of the cases of epiglottis, the epiglottis has been seen of a red colour, enlarged, and, on drawing the tongue forward, erect, as it were, or covered with false membranes: to the touch, it has been swollen, hard, and prominent. In all cases, there has been great difficulty in deglutition, which appears to be of two kinds—one, which has been termed *pharyngeal*, the other *laryngeal*: the *former*, at times, altogether mechanical in its character, and owing to the narrowness of the passage for the food into the pharynx; at others, owing to the excessive sensibility of the epiglottis, and to the sort of convulsive effort occasioned by the pain during the contraction of the pharynx;—the *latter*, or the laryngeal dysphagia, being dependent upon a small portion of liquid passing, during deglutition, into the larynx, and occasioning a convulsive cough for its expulsion. This difficulty, or impracticability of swallowing, when it coincides with the absence of active inflammation and great swelling of the tonsils, is considered by M. Dezeimeris to indicate inflammation of the epiglottis. Taken alone, it may merely announce the existence of inflammation of the upper part of the larynx, in which, however, the epiglottis is frequently involved.

At times, a sensation, as if an extraneous body were in the fauces, is experienced, with pain at the anterior and superior part of the neck, above the larynx. There is always, too, considerable pain in moving, and especially in protruding, the tongue; and as the root of the epiglottis is studded with glands or follicles, the inflammatory irritation stimulates them to an increased secretion of mucus, which is detached with difficulty, giving rise to constant efforts, that greatly harass the patient, causing paroxysms of dyspnœa, and preventing sleep.

Causes, and Treatment.—These are essentially the same as in pharyngitis, amygdalitis, and laryngitis. In addition to other means, stress has been laid on the application of a solution of nitrate of silver to the inflamed epiglottis.

℞.—Argent. nitr. gr. x.
Aquæ destillat. f℥i.—M.

It may be readily applied by sewing a dossil of lint to the end of the finger of a glove, and placing it on the forefinger. The tenacious mucus, which collects about the top of the larynx, in this and other diseases, may often be removed by the same agency.

II. INFLAMMATION OF THE LARYNX.

Synon. Laryngitis, Inflammatio Laryngis, Cynanche Laryngea, Angina Laryngea; *Fr.* Laryngite, Catarrhe Laryngien, Angine Laryngée; *Ger.* Entzündung des Kehlkopfs.

Inflammation of the larynx, not many years ago, was scarcely studied as a distinct disease. In the Nosology of Dr. Good, the term laryngitis is not to be met with; the disease being comprised under the head of *Empresma Bronchitis*, along with *Cynanche trachealis, Cynanche stridula, Cynanche laryngea, Angina polyposa, Expectoratio solida, Cauma bronchitis, Angina canina* and *Croup.* Yet it will be seen that, although inflammations of the lining membrane of the larynx, of the trachea and the bronchia, may greatly resemble each other, there is room for a well founded distinction. Another division, that of M. Andral, is into,—1. Laryngitis, with simple redness of the mucous membrane, or *Erythematous laryngitis.* 2. Laryngitis, with tumefaction of the mucous membrane. 3. Laryngitis, with copious secretion of mucus. 4. Laryngitis, with copious secretion of pus. 5. Laryngitis, with production of false membranes; and. 6. Œdematous laryngitis. There are these objections, however, to this classification—that no great advantage arises from the distinct consideration of the three first varieties; that the fourth is the chronic form of laryngitis, or laryngeal phthisis; and the fifth, laryngo-tracheitis or croup. The last, which is generally designated *œdema of the glottis*, although usually, perhaps, originating in inflammation, may not always have it as a cause. Still, it may be well to consider it under the head of Laryngitis. Another distinguished pathologist, M. Cruveilhier, divides laryngitis into two varieties, according as the diseased action is more conspicuous upon the surface of the mucous membrane of the larynx, or in the submucous cellular tissue—designating the former *mucous laryngitis;* the latter *submucous laryngitis*,—which is œdema of the glottis.

Perhaps as convenient a division, in all respects, as any, is into the *acute*, the *chronic* and the *œdematous*,—referring the fifth variety of Andral to a distinct head.

a. *Acute Inflammation of the Larynx.*

Synon. Laryngitis acuta, Laryngitis mucosa acuta, Acute Laryngitis; *Fr.* Laryngite aiguë.

Diagnosis.—The first onset of acute laryngitis rarely differs from that of ordinary sore throat; but, sooner or later, there is a sense of constriction, heat, or pricking in the region of the larynx, which is, at times, very severe when the patient speaks or coughs, or when pressure is made on the larynx. At the same time, and even before the occurrence of these symptoms, there is more or less fever. The voice, as well as the cough, is hoarse, and, at first, dry; but subsequently, an expectoration of mucus takes place, and, at times, the sputa are mixed with blood. The secretion of mucus is of little moment in the case of the adult, but becomes serious in the infant. Deglutition is, at times, difficult, or effected with inconvenience, and the inspirations are long and laborious, but by no means to the same extent as in croup, or in œdema of the glottis. In very severe cases, the dyspnœa recurs at short intervals with spasmodic force, and there is danger of suffocation, with great distress, restlessness, and starting of the eyes, followed up, if the disease be not removed, by evident sinking of the vital powers, and death.

In all cases of disease of the respiratory organs, the symptoms are liable to spasmodic exacerbations, and death would appear to arise occasionally from this cause, before the obstruction from the inflammation could be sufficient to induce fatal results. Owing to these various causes, hæmatosis is imperfectly executed, and this may be the cause of the comatose condition, which generally precedes dissolution.

Where laryngitis is to a slight extent,—as the author knows from repeated experience in his own person,—the general inconvenience may be slight; but where very severe, as remarked by M. Andral, the "great disorder of innervation may mask the symptoms of local mischief." On inspecting the throat, there may be no evidence of pharyngeal inflammation; but generally, perhaps, the mucous membrane exhibits more or less injection.

The duration of the disease, where it terminates fatally, varies according to the constitution of the patient, the extent of the lesion, and the effects of remedies. The usual duration is from three to five days, yet it has proved fatal in less than twenty-four hours. It would seem to be the disease of which the illustrious Washington died; as well as two distinguished members of the medical profession, Dr. David Pitcairn and Sir John Macnamara Hays, whose cases have been detailed by Dr. M. Baillie. Before Dr. Baillie's time, this formidable kind of laryngitis, if known, had not been accurately described; but since that period, many examples have been placed upon record.

Causes.—Exposure to cold, as in every other case of internal inflammation, has been assigned as a cause, and there is no question, that the

irregularity, induced by exposure of a part of the body to the action of cold and moisture, may excite acute inflammation of the larynx as it does inflammation of the pharynx, and other parts. It is probable, too, that they who are liable to attacks of amygdalitis, may be more subject to acute laryngitis; but the author is unable to state this as the result of any numerical estimate. It is also said to occur sympathetically in cases of acute gastroenteritis. As a consequence of the major exanthemata, it is met with along with inflammation of the air passages in general, and the complication renders those diseases more formidable. It has likewise been occasioned by the inhalation of hot steam, and by drinking hot water from the spout of a teapot.

Acute laryngitis may occur at all ages. It has been observed in the new-born; but it is extremely rare in childhood: on the other hand, inflammation of the larynx and trachea with the production of false membranes is common in childhood, and rare in the adult age. There are very few cases on record, in which acute laryngitis, of the kind now described, has attacked persons under the age of twenty. Of twenty-four cases collected by Mr. Ryland, two only were under the age of 20; four between 20 and 30; six between 30 and 40; five between 40 and 50; three between 50 and 60; and four betwen 60 and 70. We have no exact data, however, in regard to the influence of age as predisposing to the disease. Of 28 cases, taken indiscriminately from various works, 22 occurred in males, and only 6 in females. This may be owing to the former being more liable to irregular exposure, and to the more powerful exertion of the vocal organs; for this has been assigned as a cause of acute laryngitis as well as of the chronic form. M. Schönlein affirms, that the disease is common in elevated plains, but less known in low swampy districts; and this has been presumed to apply to most diseases of the respiratory organs.

Pathological Characters.—The common appearances presented in acute laryngitis are, an inflamed and thickened state of the epiglottis, which is, at times, observed standing erect, so as to leave the larynx entirely uncovered. This enlargement is owing chiefly to submucous infiltration. The mucous membrane lining the larynx exhibits the ordinary signs of inflammation with more or less of the same kind of infiltration; and if the disease have not been rapidly fatal, ulceration may be met with; and pus has been observed in the ventricles of the larynx. The condition of the epiglottis would of itself account for the difficulty of deglutition, which is sometimes considerable.

Treatment.—The lighter forms of erythematous laryngitis require but little treatment. Perfect rest in bed, with gentle cathartics, and warm diluents, so as to equalize the circulation over the whole surface, are generally sufficient. The severer forms, however, require the most energetic measures, and even these are too often unsuccessful. In the early period of the disease, when the circulation is active, and the pain and constriction of the larynx are considerable, blood-letting should be employed so as to make a decided impression on the system, and it must be repeated if the symptoms demand it. Leeches

should also be applied freely over the upper and front part of the neck, and a warm poultice, if it can be borne, over the leech-bites.

When blood has been copiously drawn, more or less reaction usually succeeds, which must be met by contra-stimulant doses of the tartrate of antimony and potassa;[a] pediluvia, simple or sinapized; mucilaginous drinks, as gum-water,[b] or the infusion of benne, or of the slippery elm; and cathartics,[c] and simple or cathartic enemata.

[a] R.—Antim. et potass. tart. gr. iv.—xij.
Mucilag. acac. f℥iij.
Aquæ f℥vj.—M.
Dose, a tablespoonful, every two or three hours.

[b] R.—Acac. ℥j.
Aquæ Oij.—M.

[c] R.—Infus. sennæ f℥ij.
Magnes. sulphat. ℥iij.
Ol. menthæ pip. gtt. vj.—M.
Dose, one half, and in two hours the remainder, unless the first should take effect.

The patient should be forbidden to speak, and the recommendation, that the air of the chamber should be preserved at an equable and mild temperature, is judicious.

If these means do not prove efficacious, a revellent treatment should be immediately adopted, which may consist in the free administration of mercurials,[a] so as to induce ptyalism.

[a] R.—Pil. hydrarg. gr. xx.—in pil. iv.
Dose, two, night and morning.
Or, Hydrarg. chlorid. mit. gr. i.
Conserv. rosar. q. s.—ut fiat pilula.
Dose, one, night and morning; aided by rubbing on the inner side of the thigh a drachm of the *unguentum hydrargyri;* and dressing the incisions made by the scarificator with the same ointment, so as to induce ptyalism, if practicable.

Should all these means fail, the practitioner must be prepared for the operation of tracheotomy, but it is of no use, unless performed early, and before the patient is evidently sinking. In some cases, in which it has been practised, the exhaustion has been so great, that reaction and recovery could not take place even when the respiration was rendered free by the operation. It gives time for the action of remedies, and all the writers on this subject have urged the importance of employing it early in the disease, and as soon as the attacks of threatening suffocation seize the patient. Where the spasms have supervened, and tracheotomy is not practicable from any cause, full doses of opium, or of its preparations, are indicated, (3 grains of soft *opium* in pill, or the equivalent in the preparations of opium or salts of morphia), which are valuable sedatives, and not only allay the spasms, but diminish the over-action of the circulatory system. In six of Mr. Ryland's twenty-eight cases, before referred to, tracheotomy was performed, and in four a cure was effected; in the remaining two, temporary relief only resulted. It has been urged, that the operation frequently fails, owing to the too small size of the canula employed. M. Trousseau uses a middle-sized canula at first, and gradually increases the size, until the air almost ceases to make any noise in passing through it during a deep inspiration.

b. *Chronic Inflammation of the Larynx.*

Synon. Chronic Laryngitis.

This term has been used synonymously with *Laryngeal phthisis, Phthisis laryngea, Laryngophthisis*; Fr. *Laryngite chronique, Phthisie*

laryngée, Laryngite avec sécretion de Pus; Ger. *Kehlkopfschwärsucht;* whilst laryngeal phthisis itself (Ger. *Kehlkopfs und Luftröhrenschwindsucht, Halsschwindsucht,*) has been employed by MM. Trousseau and Belloq, to comprise "any chronic alteration of the larynx, which may bring on consumption or death in any way." It has been used, indeed, to include all chronic diseases of the larynx. In this work, the epithet "chronic" is employed in regard to laryngitis, in the same manner in which it is applied to other inflammations of mucous membranes:—to signify inflammation of the lining membrane of the larynx, or of the subjacent parts, the duration of which is long, or whose symptoms proceed slowly.

Diagnosis.—The commencement of chronic inflammation of the various structures composing the larynx is often extremely insidious, and its progress so tardy, that much, and often irreparable mischief is accomplished before any alarm is taken by the patient, and he applies for medical assistance. Pain is felt in the larynx, but its precise situation may vary; at times, it extends over the larynx; but, at others, is restricted to a small space, and generally to the region of the thyroid cartilage. Commonly, a kind of tickling sensation exists, which provokes coughing. The pain, too, is exasperated by coughing, speaking, and deglutition, especially when ulcerations exist, and they are situate above the ventricles of the larynx. The breathing of cold air, and pressure upon the larynx, likewise augment it. The voice is almost always changed, being hoarse, and, at times, so much enfeebled, as to be inaudible. The aphonia may supervene suddenly or gradually, and ultimately be complete. Cough is a constant concomitant, and when the mucous membrane is much swollen, it becomes hoarse and even croupy. In the first instance it is dry, but subsequently it is accompanied with the expectoration of mucus, mixed occasionally with pus or blood. At other times, a membraniform matter is expectorated for months; and at others a considerable quantity of false membrane is thrown off, after which the patient rapidly recovers. Occasionally, portions of cartilage are mixed with the mucous or bloody sputa, and, in such cases, there is always accompanying hectic. Chronic laryngitis has, indeed, been divided into two heads;—the first comprising that which affects the mucous membrane and the submucous tissue; and the second, that which implicates the cartilages; the latter—it has been conceived—having perhaps the best claim to the name *phthisis laryngea*, from the incurable nature of the affection, and the hectic and emaciation, which invariably accompany its latter stages.

When chronic laryngitis is slight, and there is not much narrowness, the difficulty of breathing may not be great; but if it be attended with much tumefaction of the lining membrane, the dyspnœa is considerable, and the sound on inspiration sonorous and peculiar. It is evidently, too, augmented by paroxysms. The air of inspiration likewise gives rise to a snoring (Fr. *ronflement*) or whistling, (Fr. *sifflement,*) which may be continuous, or recur in paroxysms. These local symptoms may be so slight, that the general health does not suffer to any great degree. Commonly, however, more or less sympathetic febrile disorder is apparent, under which nutrition is impaired, and atrophy supervenes.

The disease now merits the term *Laryngeal Phthisis*, which is, however, in the immense majority of cases, connected with the presence of pulmonary tubercles.

Chronic laryngitis may be primary, or it may succeed to acute laryngitis, and when apparently terminating in health, it is readily reproduced by exposure to cold, errors in diet, &c. &c. Its duration varies from a few months to several years. When the fauces are inspected, but little evidence of disease may be perceptible; at other times, however, the mucous membrane is injected, and the follicles are so large as to resemble split peas. Whether this enlargement of the follicles be the cause or effect, may admit of a question. The enlarged follicles probably exist lower down, where they cannot be inspected. This form of laryngitis is the one often known under the name "*Clergymen's sore throat.*"

Chronic laryngitis may terminate in health; but it is more likely to end fatally; and this may occur in different modes,—either by the lungs becoming implicated, or by the extent of the laryngeal lesions themselves, which may excite severe irritative fever, or interfere with the entrance of air into the lungs, and thus induce asphyxia. In almost all cases of phthisis laryngea, the disease is complicated with pulmonary tubercle. Dr. Stokes, indeed, asserts, that after ten years of hospital and private practice, he never saw a case presenting the symptoms of laryngeal cough, purulent or muco-purulent expectoration, semi-stridulous breathing, hoarseness, or aphonia, hectic, and emaciation, in which the patient did not die with cavities in his lungs. In some, the laryngeal affection seemed to be primary; but, in the great majority, symptoms of pulmonary disease existed previous to its appearance. Such, also, is the result of the author's observation.

In many cases of pulmonary phthisis,—sore throat, hoarseness, or aphonia, with cough, occur; but the case is different, when the laryngeal symptoms have been primary.

Causes.—The same causes, that give rise to acute laryngitis, may induce the chronic form also. It may be caused, like the acute, by the inspiration of acrid substances, or by extraneous bodies received into the larynx. The habitual and intemperate use of ardent spirits has likewise been esteemed a cause, as well as the effect of mercury. These act either as predisposing or exciting causes. It is often the result of phthisis pulmonalis; whilst, on the other hand, the pulmonary irritation, induced by it, may occasion the development, and augment the course of tuberculosis of the lungs in those who are predisposed to pulmonary consumption. The co-existence of ulceration of the lungs, and of suppurated pulmonary tubercles, has often been proved. In one-fourth of the cases of phthisis, ulceration of the larynx has been observed; in one-sixth, ulceration of the epiglottis; and ulceration of the trachea was met with by M. Louis more frequently than either of the other lesions. It is probable, however, that idiopathic chronic laryngitis rarely produces the symptoms of phthisis; but the two diseases are frequent concomitants.

Amongst the exciting causes are mentioned—prolonged action of the vocal organs; hence the disease is said to be frequent among ac-

tors, singers, lawyers, preachers, &c. It has already been remarked, that it is so common amongst the last, as to have received the name of the *clergymen's sore throat;* yet why it should prevail among them more than among lawyers, professors, &c., who use their vocal organs more, is not clear. It has, indeed, been suggested, by Dr. Chapman, of Philadelphia, that clergymen, as a class, are of feebler constitutions, which circumstance may have originally led them to embrace their avocation; and, hence, that they are more liable to such derangements than more healthy individuals; but this does not seem sufficient to account for the difference. Another explanation has been offered by Dr. Stokes—that the clergyman begins to exercise his vocal organs at a much earlier period than the lawyer, for example. The young clergyman, often of a feeble and nervous constitution, and acting under conscientious motives, to the neglect of bodily health, not only reads the service, and preaches once or twice, or even more frequently in the week, but is exposed to night-air and the inclemency of the weather. He is compelled to do so, while both the larynx and constitution of the lawyer have generally full time for maturity, before he need employ the one or expend the other in the duties of his profession.

Syphilis would appear to be a frequent cause of chronic laryngitis, and especially of the ulcerative form,—the ulcers extending, at times, from the throat by continuity of surface.

As to age, the disease has certainly been observed most commonly between twenty and forty; but, as to sex, discrepancy of sentiment exists;—some, as Mr. Ryland, affirming, that the number of females, attacked by it, is infinitely greater than that of males; others, as M. Andral, that males are more frequently affected than females.

Pathological Characters.—Chronic inflammation induces the same changes in the laryngeal mucous membrane as in other membranes of the class;—for example, redness, increased thickness, and alteration of consistency, over a greater or less extent of surface. Occasionally, too, vegetations of considerable size, and white and hard granulations, are perceptible. Pus, too, is generally found covering its surface. The mucous follicles, both of the lining membrane of the pharynx and larynx, are frequently enlarged, especially in that form of the disease to which clergymen are subject, and they seem filled with a yellowish matter. Ulcerations are likewise very common, so as even to destroy the vocal cords. The submucous cellular tissue is often infiltrated by a thin fluid; and at times, collections of pus exist in it; at others, it is indurated, and tubercles are found in different stages of development. The intrinsic muscles of the larynx have been found much reduced in size, softened, and occasionally destroyed. At other times, they have been hypertrophied. The epiglottis may be thickened, ulcerated, carious, and even completely destroyed; yet the patient may have been able to swallow to the last. (See p. 241.) Of the cartilages of the larynx, the cricoid and the arytenoid are most frequently diseased—the thyroid least so. Occasionally, they are ossified, or ossific points are deposited on the mucous membrane. In broken down constitutions, in which large quantities of mercury have been used, it has been remarked by

Drs. Graves and Stokes, that chronic laryngitis is very apt to terminate in ulceration of the cartilages.

Treatment.—In the treatment of chronic laryngitis, at all stages, rest of the vocal organs is indispensable; but it is difficult to have it rigorously enforced. In the early periods, bloodletting from the arm is sometimes demanded, and in almost every case, it will be advisable to apply cups to the nape of the neck, or top of the chest; or, what is better, leeches freely over the seat of the disease. Emollient fomentations and poultices, likewise afford relief, but they have been objected to—probably altogether on hypothetical considerations—under the idea that they solicit an increased flow of blood towards the throat, and thus aggravate the disease. Revellents are certainly important remedies. A blister may be applied to the top of the sternum, or over the trachea, and as soon as it heals, another should be applied, so as to keep up an intermittent, which is preferable to a permanent irritation. Hence blisters, thus employed, are better than setons; and the ointment of the tartrate of antimony and potassa,[a] or croton oil[b] is, perhaps, preferable to either.

[a] R.—Ant. et potass. tart. p. j.
Adipis, p. vij.—M.
A piece, the size of a hazelnut, to be rubbed on the region of the larynx, night and morning.

[b] R.—Ol. tiglii, p. j.
—oliv. p. ij.—iij.—M.
A few drops to be rubbed in at a time.

With the view of procuring rest, opium and its preparations may be given. They are useful, likewise, in allaying cough.[a] The salts of morphia may also be employed endermically,[b] and advantage has been derived from frictions over the larynx with the extract of belladonna.[c]

[a] R.—Tinct. opii.
—— digital. aa gtt. xl.
Mucilag. acaciæ
Syrup. aa f℥iij.
Aquæ f℥vj.—M.
Dose, two tablespoonfuls, three or four times a day.

[b] R.—Morphiæ acet. vel
Morphiæ sulphat. gr. ss.—gr. i.—sprinkled over a blistered surface.

[c] R.—Ext. belladonnæ ℥j.
Cerat. commun. ℥xi.—M.

Where the affection of the larynx has lost its inflammatory character, and any of its terminations remain, topical remedies may be employed. These have, indeed, been regarded by MM. Trousseau and Belloq as the most efficacious of all. They may be made to come into immediate contact with the diseased surface itself. At an early period of the disease, inhalations of the steam of warm water may be employed with advantage, but subsequently more excitant applications are needed, to induce a new action in the diseased surface. Inhalations, however, are liable to the inconvenience, that they cannot be restricted to the larynx; and, consequently, no agents are administered, in this manner, in cases of chronic laryngitis, except such as do not over-excite the mucous membrane of the lungs. The vapour of hot water, to which one of the essential oils has been added, may be used in the way of inhalation, with safety and occasional benefit. Various forms of apparatus have been devised for this purpose; but MM. Trousseau and Belloq frankly confess, that a simple

teapot is as well adapted to the purpose as the most complicated machines. In this way, chlorine, creasote, and iodine, may be inhaled under the circumstances laid down under Phthisis Pulmonalis.

Topical remedies, in solution, are more to be relied on. Of these, nitrate of silver, corrosive sublimate, sulphate of copper, nitrate of mercury, and Lugol's caustic solution of iodine, (*New Remedies*, 5th edition, p. 520, Philad. 1846,) have been employed, but the nitrate of silver is to be preferred, on account of its rapidity of action and harmlessness. It may be used in the proportion of ten to forty grains to the fluidounce of water, and it has been prescribed as strong as one part of the nitrate to two parts of water. Various plans have been adopted for applying it. The author uses a mop of rag at the extremity of a piece of whalebone. Others attach a piece of sponge to the end of a quill, dip it in the solution, and having slightly squeezed it to prevent the fluid from dropping, they touch the posterior fauces; raise the outer extremity of the quill so that the sponge may touch the epiglottis and superior part of the larynx, and draw it gently out in this manner. Thus, the solution is made to come into immediate contact with the inflamed surface. By others, it has been advised to take up a drop of the strong solution on the bent extremity of a piece of firmly rolled paper, or whalebone, and to cause this to touch the lining membrane of the larynx. It has been suggested, that the solution may be thrown, in the form of a shower, into the larynx, from a small silver syringe, like Anel's; but the plans just recommended, have the merit of being more easy of application. One—before mentioned—proposed by Mr. Cusack, of Dublin, has been regarded by a competent observer, Dr. Stokes, as the best of all. A brush of lint, of the requisite size, is sewed on the end of the finger of a glove, which is then drawn on the index finger of the right hand. The patient is made to gargle with warm water, and the lint being dipped in the solution, can be readily applied to the larynx. The great value of these topical remedies to the diseased surface has been urged, of late, by Dr. Horace Green, of New York, who has employed them extensively and beneficially.

When the disease is dependent upon any syphilitic *vice*, it may be necessary to administer mercury, or some other revulsive agent—iodine, for example. When mercury is pushed so as to affect the mouth, it sometimes breaks in upon the morbid chain where no *vice* is suspected or present. It should be given, under such circumstances, so as to exert its ordinary influence slightly on the mouth. When, however, pulmonary tubercles are coexistent, care must be taken in the administration of this potent remedy, as the dyscrasy, induced by it, may cause their development. Where the disease is dependent upon the use of mercury, it should, of course, be carefully abstained from, and an appropriate treatment, in which rest and the free use of iodine are combined, should be prescribed.

In many cases, the spasmodic exacerbations are very severe and distressing: they may be assuaged by opiates, or by the application of the *emplastrum belladonnæ* or *emplastrum opii*.

Lastly,—a question may arise as to the necessity for the operation

of tracheotomy. Although frequently demanded in acute laryngitis, and not to be postponed, it is rarely necessary in cases of chronic laryngitis; but should symptoms, similar to those of acute laryngitis, which demand the operation, arise, it must be unhesitatingly performed. It is probable, however, that in such a case, the operation could be of but transient benefit; so much disorganization must have occurred as to render ultimate recovery almost wholly, if not wholly, hopeless.

c. *Œdematous Inflammation of the Larynx.*

Synon. Œdematous laryngitis, Œdema of the glottis, Œdema glottidis, Hydrops glottidis, Laryngitis submucosa seu seropurulenta, Angina aquosa, A. laryngea œdematosa, Submucous laryngitis, Œdematous Angina, Cynanche laryngea; *Fr.* Laryngite œdémateuse, L. œdémateuse et séro-purulente, Angine laryngée œdémateuse, L. sous-muqueuse, Œdème de la glotte; *Ger.* Œdem des Kehldeckels der Stimmritze und des Larynx, Erysipelatöse Entzündung des submucösen Zellgewebes des Kehlkopfes.

The œdematous condition of the larynx has been considered by most pathologists to be dependent upon previous inflammation; yet a similar state has been observed as an accompaniment of the leucophlegmatic habit; so that some have been disposed to admit an œdema of the glottis of an idiopathic character, in which the submucous infiltration is wholly serous; and another—symptomatic or inflammatory—in which the fluid in the submucous tissue is seropurulent. The character of the secreted fluid cannot, however, be regarded as a sufficient ground for difference in pathology.

Diagnosis.—The first symptoms resemble those of ordinary laryngitis. There is pain, or uneasiness, at the upper part of the larynx, which gives occasion to the sensation of a foreign body lodged there. Cases, indeed, it is affirmed, have occurred, in which bronchotomy has been resorted to, for the removal of the suspected foreign body; yet nothing of the kind could be discovered after the most careful examination; and it has been suggested, that such a mistake may occur from the close resemblance between the symptoms of œdematous laryngitis and those caused by the presence of a foreign body. In the latter case, however, both inspiration and expiration are sibilant and difficult; whilst, in œdematous laryngitis, the inspiration alone is sonorous or sibilant, the expiration being free and easy. This is owing to the œdematous mucous membrane being drawn into the aperture of the glottis during inspiration; and to the passage, during expiration, being left entirely clear. Expiration, indeed, takes place with so much ease, that M. Blache regards this as a pathognomonic sign. The voice is raucous, bass, and discordant; and, occasionally, altogether suppressed.

From the very commencement of the disease, the breathing is extremely difficult, and in paroxysms, which threaten immediate suffocation. These become more and more severe. Sleep cannot be indulged; or, if the patient fall into a nap, he is awoke by violent attacks of suffocation. The severity of the symptoms gradually increases, and death closes the scene, either suddenly, or after the most horrible suffering.

Percussion and auscultation afford only negative signs; but this

circumstance, in the absence of other diseases of the larynx and trachea, ought to cause the suspicion of œdema of the glottis. If the finger can be carried along the tongue as far as the glottis, or even the upper extremity of the larynx, a soft projecting ring or cushion may be felt protruding into the tube, which has been esteemed a pathognomonic sign of the disease. In order to accomplish this, the mouth should be propped open by means of a piece of wood, introduced between the upper and under molar teeth, and the root of the tongue be drawn forwards by means of the handle of a spoon. The finger may then—and especially in females in whom the space between the mouth and the larynx is shorter—be able to attain the lips of the glottis. In males, however, the plan, according to Mr. Ryland, has failed, and MM. Chomel, Blache and Grisolle could not detect the seat of the disease in this manner; spasmodic closure of the superior orifice of the larynx, and the excited retching having always put a stop to the exploration.

The age of the patient is a principal means of diagnosis between œdematous laryngitis and croup. The latter disease is rare in the adult, and on the other hand, œdema of the glottis has only been observed at that age.

It has been elsewhere remarked, that aneurism of the aorta has been mistaken for laryngitis, and it may be confounded with this form of the disease, the pressure of the tumour giving occasion to sibilant inspiration, and paroxysms of suffocation; but careful attention to the signs afforded by auscultation will sufficiently diagnosticate the two affections. Cases, too, are recorded, in which abscess behind the œsophagus has been mistaken for œdema of the glottis, and in which death has taken place from asphyxia.

The progress of œdematous laryngitis is commonly very rapid, and it is almost always fatal. Of seventeen cases recorded by M. Bayle one only recovered. M. Valleix refers to thirty-nine cases, of which nine were cured.

Causes.—These are usually not appreciable. It is said to have been owing, in some cases, to rheumatic metastasis. Recently, Dr. Budd has endeavoured to show, that the affection is really erysipelas commencing in the fauces or in their neighbourhood; and he records five cases, in three of which the inflammation commenced in the fauces; in one in the parotid gland, and in one in an erysipelatous blush at the angle of the lower jaw. In all the cases, the inflammation soon spread to the glottis and produced there the same pathological results in all,—redness, great thickening of the epiglottis and of the lips of the glottis, with infiltration of sero-purulent fluid into the submucous cellular tissue to such a degree as, in three of the cases, to produce almost sudden closure of the glottis, and consequent suffocation.

The occasional connexion between laryngitis and erysipelas had been already noticed by Dr. Cheyne, Mr. Wood, and Mr. Ryland.

Pathological Characters.—The sides of the larynx, and especially of the glottis, are thickened so as to form a soft ring or cushion, caused by a serous or sero-purulent fluid, which gives it a yellowish or grayish

appearance. This generally closes almost entirely the aperture of the glottis.

Treatment.—The treatment to be adopted in this disease may have to vary according to the accompanying condition of the system. Generally, the inflammatory evidences are by no means marked;—the pulse and heat of the skin being perhaps unmodified, so that the disease appears to be wholly local. It cannot often happen, therefore, that general bloodletting is needed. Leeches may be applied over the neck, and, lower down, a blister; every revellent agency must, indeed, be had recourse to, to divert the local mischief from the larynx. Emetics and cathartics should be administered,—the former every few hours so as to cause vomiting, (*ant. et potass. tart.* gr. ij.—iij.;) and, even if vomiting should not be induced, the contra-stimulant agency of the antimonial may be beneficial. Any of the ordinary cathartics may be administered;[a] stimulant enemata may be thrown into the rectum every few hours, and sinapisms be applied to the legs, feet, or arms.

[a] R.—Jalap. pulv. vel
Rhei. pulv. gr. xv.
Hydrarg. chlorid. mit.
Zingib. pulv. aa gr. v.—M.

It has been suggested, that large doses of calomel (gr. v.—x. every hour) should be administered, which, either by their purgative effect, or by their revellent action on the general system, may tend to check the inflammation of the glottis, and to promote the absorption of the effused fluids.

Should these remedies have been employed, and attacks of impending suffocation be urgent, the operation of tracheotomy must be practised; but, as in cases of ordinary acute laryngitis, it must not be postponed too long, otherwise it also must fail. It has been proposed, that the moment the nature of the disease is known the operation should be practised, and that it should be followed up by the revellent treatment just recommended; or that, in its place—and the plan is preferred by some—an elastic gum tube, open at both extremities, and of the proper size, should be introduced into the larynx from the mouth, so as to keep the passage open. It is scarcely possible, however, to conceive, that any benefit could accrue from the presence of an extraneous body in such a condition of the parietes of the larynx. Another plan—scarcely, if at all, more feasible—is to pass the finger into the glottis, and to make pressure on the infiltrated parts, so as to diminish their volume; and, lastly, it has been proposed to scarify the engorged parts, so as to permit the escape of the fluid. Both these plans have been characterized by Mr. Ryland as fantastic, very difficult, if not impossible, of accomplishment, and more likely to increase than diminish the existing evil. The last is undoubtedly extremely difficult of execution; but, if it could be carried satisfactorily into effect, it would offer great probability of benefit. The danger of the disease is, in some measure, proportioned to the extent of the tumefaction; and any method, that would abstract the effused fluid, could not fail to afford essential relief.

It would seem, according to Dr. Budd, that success has attended the

making of a number of punctures on the back of the tongue and fauces with a sharp bistoury,—the operation being repeated every two or three hours; and Dr. Buck, of New York, at a recent meeting of the New York Medical and Surgical Society, narrated a case in which the patient, whilst suffering under inflammation of the fauces, became affected with dyspnœa, attended with paroxysms of impending suffocation. On passing the finger into the fauces, the epiglottis could be felt enormously tumefied and tense. Swelling of the glottis could likewise be distinguished. He determined to make incisions into the tumefied parts; for which purpose a pair of curved sharp-pointed scissors was employed, and afterwards a curved sharp-pointed bistoury, guarded to within a quarter of an inch of the point. The patient spat up two or three teaspoonfuls of blood, mixed with the secretions of the fauces, and expressed himself decidedly relieved. He subsequently recovered. It is proper to remark, that in addition to the operation the patient was bled, leeched, inhaled aqueous vapour, &c.

II. INFLAMMATION OF THE LARYNX AND TRACHEA.

Synon. Cynanche Trachealis, C. Stridula, Cynanche vel Angina Laryngea of some, A. Membranacea, A Strepitosa, A. Exsudatoria, A. Polyposa, A. Trachealis, A. Strangulatoria, A. Humida, A. Suffocativa, Suffocatio Stridula, Laryngitis et Tracheitis Infantilis, Laryngostasis Infantum, Empresma Bronchlemmitis, Morbus Truculentus Infantum, Orthopnœa Cynanchica, Pædanchone, Trachitis, Tracheitis, Diphtheritis Trachealis, Laryngotracheitis, Laryngotracheitis with Diphtheritic Exudation, Laryngocace, Laryngitis with production of False Membranes, Plastic or Pellicular Inflammation of the Larynx, Croup, Roup, Hives, Choak, Stuffing, Rising of the Lights, &c.; *Fr.* Croup, Angine Laryngée et Trachéale, Laryngite avec production de Fausses Membranes (*Andral*), L. Pseudomembraneuse; *Ger.* Croup, Häutige Braune, Entzündung des Luftröhrenkopfes, Hühnerweh, Croupöse Laryngotracheitis.

Diagnosis.—This disease is a combination of laryngitis and tracheitis; which last does not differ materially from laryngitis, except by its seat, and, therefore, does not require a distinct consideration. The disease about to be investigated, is not, however, a simple laryngotracheitis, but an inflammation often accompanied with the production of false membranes, differing, consequently, from the inflammatory affections of the larynx that have been thus far considered. Of late years, it has been maintained by M. Bretonneau to be identical with the diphtheritic inflammation of the supradiaphragmatic portions of the alimentary canal, which have been described collectively under the name *Diphthérites;* and a recent writer, M. H. Bell, has observed, that the ideas of M. Bretonneau on croup are, at the present day, generally admitted, "supported, as they have been, by the anatomopathologists, who have made their observations since him, the question turning no longer on the existence of the diphtheritis, but on its nature." It is not accurate, however, to ascribe such sentiments to the generality of pathologists. Almost all admit, that the essential character of croup, in the child, is a violent inflammation, apt to be accompanied by an exudation of plastic lymph; but the generality of American and British practitioners regard this idiopathic inflammation of the larynx and trachea, or rather of the latter—for the larynx is generally but little implicated —as very different from the diphtheritic inflammation that occurs in diphtheritic stomatitis and pharyngitis, in which, as has been shown,

there is always precedent fever, and the formation of false membranes in the mouth and pharynx, which may extend down the windpipe, and give rise to symptoms of croup in the advanced stage of another and totally different disease. It is extremely doubtful, indeed, whether the mild cases of croup—which are relieved by simple treatment, are unaccompanied by fever, and form, perhaps, a large proportion of the cases ordinarily classed as croup,—have any tendency to the formation of false membranes. They have been considered as cases of simple laryngeotraheitis, and have been classed by M. Berton amongst the false croups—*faux croups;* and by others have been termed *spasmodic croup.*

The inflammatory idiopathic croup, in which the accompanying fever is symptomatic, Dr. Stokes has termed *primary croup.* It is that which we meet with in childhood; whilst *secondary croup* comprises the symptomatic affection just described, and is the croup of the adult—the *Diphthérite* of M. Bretonneau. Between these two forms of croup, Dr. Stokes has pointed out differences, which are well shown in the following tabular form, modified by Dr. Copland, from one by Dr. Stokes.

TRACHEOLARYNGITIS OR PRIMARY CROUP.	PHARYNGOLARYNGITIS OR SECONDARY CROUP.
1. The windpipe first attacked.	1. The laryngeal affection consecutive of disease of the pharynx and fauces.
2. The local disease the chief cause of the attendant fever. The fever symptomatic.	2. The local disease occurring in the course generally of a constitutional, and most commonly of a febrile malady.
3. The fever inflammatory.	3. The fever subinflammatory, adynamic or malignant.
4. Children principally attacked.	4. Both adults and children attacked.
5. Sporadic, and in certain situations endemic; but never infectious.	5. Frequently epidemic and generally infectious. [?]
6. The exudation of lymph spreading from the trachea to the glottis, or from below upwards.	6. The inflammation and the exudation attending it spreading from the throat, or from above downwards.
7. The pharynx healthy.	7. The pharynx diseased.
8. Dysphagia either absent or very slight.	8. Dysphagia common and severe.
9. Catarrhal symptoms often precursory to the laryngeal.	9. Laryngeal symptoms occurring without the pre-existence of catarrh.
10. Complication with bronchial or pulmonary inflammation frequent.	10. Complication with these diseases rare.
11. Absence of any characteristic odour of the breath.	11. The breath often characteristically fetid.
12. Necessity for antiphlogistic treatment, and the frequent success of it.	12. Antiphlogistic treatment very rarely requisite. Restorative, tonic, stimulating and other remedies necessary.

The symptoms of the idiopathic croup of childhood are sufficiently distinctive. The onset of the disease is various. At times, with all the signs of health, the child is suddenly attacked with pain in the throat, hoarse cough, of the peculiar kind to be mentioned presently, and difficulty of breathing, soon followed by fever, of greater or less severity: the disease, in such cases, arrives at its greatest intensity in a very short period, at other times precursory symptoms exist for a longer or shorter period, occasionally for days, such as cough and hoarseness, but without any fever; after which the symptoms of croup become declared. Most commonly, the attacks occur in the night, and

often after the child has been unusually active during the day. The danger of the disease, when neglected, is so well known, that parents are familiar with the cough of croup, and on the alert, should the child cough as if the sound passed through a brazen trumpet, or resembled the barking of a dog. In such case, the child, when the affection is slight, may awake without much evidence of disease; the cough may persist through the night, but gradually lose the croupy character before morning, and there may be no accompanying fever. In more severe cases, however, on awaking, the voice may be sharp and stridulous; the inspiration distinctly audible and laboured, and, often, of a crowing character, when the narrowness of the air passage is considerable; the child is evidently distressed; the face more or less swollen and suffused; the skin hot, and the pulse frequent and hard. After the disease, if left to itself, or if obstinate, have been thus active, there may be—as in other diseases of the respiratory apparatus—alternations of exacerbation and remission; but the disease makes progress; the hoarseness and dyspnœa augment; the voice is lost, and the lividity of countenance indicates the imperfect hæmatosis, under which the child gradually sinks,—or, what is more common, dies in a paroxysm of suffocation, even when the appearances, on dissection, may not exhibit sufficient narrowness of the air-passages to account for death.

In younger children, the expectoration, where any exists, is swallowed, so that it cannot be regarded in the diagnosis; but in older children, in the latter stages, pus is occasionally expectorated; with portions of a whitish membraniform substance. When this exudation has taken place, the difficulty of breathing is often most distressing; the head being forcibly thrown back, so as to stretch the trachea, and this may be the only posture in which temporary relief is obtained.

The ordinary period of termination, is from the third to the fifth day; but it is asserted by MM. Gölis and Albers, that the disease may become chronic, and continue for two or three weeks. The author has not met with a case of the kind.

The physical signs in croup, although not as important as in diseases of the lungs, cannot be regarded with a distinguished observer, M. Laënnec, as useless. Very commonly, indeed, the case is complicated with pulmonary disease, which cannot be overlooked either in the diagnosis, or prognosis. If the disease be confined to the larynx and trachea, there will be no dulness on percussing the chest; and hence this negative sign is of moment. Where there is any complication of bronchitis, or pneumonia, they can be detected by the signs afforded by those diseases on auscultation. It is important, however, to bear in mind, that the sounds may be masked by the stridulous breathing. When the false membrane is partially detached, we may have a clapper or valve-like sound on inspiration, when the upper extremity of the membrane is partially detached; and on expiration, when the lower extremity is detached, and moved by the passage of the air through the larynx.

Where a false membrane has been thrown out, Dr. Ware, of Boston, has observed similar exudations on the fauces. Of 33 cases of

membranous croup in which the fauces were examined, 32 presented false membranes on the tonsils, uvula, palate, or pharynx. The diagnosis was, however, verified by examination after death in only 14 cases; the others not having been examined; but, in all the 14, membranes were found in the air-passages; and in 1 only they were present in the larynx, whilst no trace of them existed in the fauces. In 45 cases of what he classes as other forms of croup, according to the table given hereafter, Dr. Ware found, that 3 only presented a thin slight exudation on the tonsils; none a regular false membrane. Of these 45, 12 were of the second; 11 of the third, and 22 of the fourth class in the table.

Causes.—Although we are not well informed as to the causes of croup, there are a few points which merit mention.

Age unquestionably has a decided influence. After the first year and up to eight or ten years is the period most liable to it. After puberty it is extremely rare, and the cases that have generally been so regarded belong rather to the division of secondary croup. From the experience of several writers, who have published the results of their observations, it would appear, that it has been observed only once at the age of seven months, and never at any antecedent period; that it has not occurred at a later age than twelve years; and that from two to ten was the common age at which it was observed. It certainly is extremely unfrequent in children at the breast, yet it is stated by M. Dugès to have been seen in an infant a few days old. Diphtheritic inflammation of the mouth and throat is very common at this early age, but that affection—as we have seen—is different from primary or idiopathic croup, to which the older child is subject.

In Philadelphia, according to Dr. Condie, during the ten years preceding 1845, 475 deaths are reported from croup, between the ages of two and five years; 238 between one and two years; 319 under one year; 112 between five and ten years; and 6 in children over ten years. Of 189 cases collected by Sachse, 16 were under one year; 48 between one and two; 25 between two and three; 31 between three and four; 27 between four and five; 17 between five and six; and 18 between six and seven.

Sex also affords a predisposition. Of 543 cases of true and false croup, collected by M. Guersent, 325 were of the male sex, and only 218 of the female. According to the census of Ireland for 1841, the proportion in the preceding ten years was 100 males to 82·89 females. Of 1150 deaths from croup, in the Philadelphia Bills, during the ten years preceding 1845, 612 occurred in boys, and 538 in girls: and it is stated by Dr. Condie, that the deaths from the disease in the London Hospitals, in 1840, were in the ratio of three males to one female. M. Wunderlich makes the same ratio apply generally. This may be mainly owing to the greater exposure to vicissitudes of the former than the latter. There can be no doubt, indeed, that irregular application of cold and moisture to the frame must be regarded as a cause of croup. It prevails more in cold and damp regions, than in those that are dry and warm. In like manner, it is more common during the spring, autumn, and winter seasons, than during the summer. The author has had an opportunity of observing croup on

the banks of the Firth of Forth, on the margins of the English lakes of Cumberland, in London, Paris, the interior of Virginia, Baltimore, and Philadelphia, and the disease certainly has not been equally severe in all these places. The cases were more usually rapid in their course, and destructive in the second of those situations, in which, unless very active measures were taken within the first twelve hours, they were too often beyond the efforts of art. In the other localities, the disease was generally subdued readily, if it were treated sufficiently early, and appropriate remedies were employed.

In certain families, owing to favouring organization, in which almost all the children have participated, scarcely any have escaped the disease. The subsequent attacks commonly, however, are more and more mild, until ultimately, before or near the age of puberty, they altogether disappear, owing to the fresh evolution at that epoch.

Croup is generally, perhaps always, a sporadic disease. It is said, however, to have prevailed epidemically, and as many as thirty-seven epidemics have been recorded. It is questionable whether any one of those was the primary or idiopathic croup of children. The same may be said of the croups, that have been esteemed contagious. When it has appeared epidemically, it has generally been complicated with diphtheritic pharyngitis, measles, scarlatina, &c.; and—as has been already remarked—belongs to an essentially different affection, being—in the first of these diseases—altogether secondary, the diphtheritis spreading from the mouth and pharynx into the larynx and trachea. There appears to be no reason for believing, that the primary idiopathic croup is ever communicable by contagion.

Croup is an extremely dangerous disease, but the results of the author's own observation have by no means corresponded with those of many pathologists as to its mortality. It has been already stated, that it is more rapid and fatal in some situations than in others; and there can be no doubt, that extensively fatal diphtheritic affections have been confounded with primary croup, so as to swell the mortality of the latter. Thus, it has been estimated by MM. Caillau and Double at two-thirds of those attacked; whilst others, as MM. Jurine and Vieusseux have estimated it at one-tenth; another observer, J. Frank, cured 39 cases, and lost 27; and a recent writer, M. H. Bell,—who avowedly regards croup as in all cases a diphtheritis—thinks the estimate of M. Caillau nearest the truth, if it be not indeed too favourable. No such mortality attends the disease in this country, or indeed in any place where the author has practised, or seen it. On the contrary, when the practitioner is called sufficiently early, it is usually manageable. Still, it is a disease in which the prognosis must be guarded. Too often, indeed, in consequence of the very slight suffering, the child, although breathing and coughing in the peculiar manner of croup, is able to play about, so that no alarm is taken until too late, and many deaths occur from this cause, which might probably have been prevented.

The remark, already made, must be borne in mind, that it is extremely doubtful whether a large proportion of the cases usually classed as croup have any tendency to the formation of false membranes.

They are of comparatively little danger; whilst membranous croup is always alarming. Dr. Ware, of Boston, in the course of 25 years, has met with 131 cases of croup—the term being applied by him to every affection in which there was any embarrassment of the respiration, accompanied with affection of the voice, and a cough of a shrill, harsh and ringing character. These cases he classifies as follows:—

	Cases.	Deaths.
Membranous Croup,	22	19
Inflammatory,	18	
Spasmodic,	35	
Catarrhal,	56	
	131	19

He distinguishes the first and second classes by referring to the former all cases in which there was reason to suppose that a false membrane had been formed; whilst the latter differs from it only in the supposed absence of a false membrane.

Pathological Characters.—The mucous membrane of the larynx and trachea, but especially of the latter, in a fatal case of croup, is found to exhibit the ordinary signs of inflammation. These may extend down into the larger and even into the smaller divisions of the bronchia. The essential character of the disease, however, is, that the tube, especially below the inferior ligaments of the larynx, is lined by a false membrane, of a pale yellow or grayish colour, the thickness of which is dependent upon the intensity of the inflammation that gave rise to it. This false membrane extends into the larger bronchial divisions, and may exist in the larynx; but it is more readily expectorated from the larynx, as it forms, whilst the narrowness formed by the inferior ligaments prevents the ready escape of that which is thrown out in the trachea. The false membrane may either form an adventitious tube, or be in detached portions, blended with mucus or flocculi of albuminous matter. At times, it is separated from the mucous membrane by a purulent or mucopurulent secretion, whilst at others it is intimately adherent to the mucous membrane. When the disease has been rapid in its course, the pseudomembrane is usually confined to the trachea, showing that the disease is essentially tracheitis. In many cases, the under surface of the epiglottis is coated by the false membrane, and the rima glottidis is obstructed by it. It is affirmed, that cases have occurred in which the mucous membrane of the air-passages was covered only by a viscid secretion or by pus, yet death took place speedily, and with the same symptoms as mark the progress of the disease in those in whom the false membranes existed. Generally, in those who die of croup, more or less evidence exists of bronchitis or pneumonia.

The false membrane has been considered by some to be organized, but it is manifestly anorganic. There can be no doubt, however, that, like other plastic productions, it is capable of becoming organized. Its chemical composition does not differ from that of the pseudomembrane of serous surfaces. It is insoluble in cold and in hot water, hardens by the action of acids, dissolves in alkalies, and consists

mainly of fibrin blended with mucus in various proportions. On examination with the microscope, it was found by Dr. Seitz to be composed almost entirely of ordinary pus-corpuscles mixed with a few of the exudation-corpuscles of inflammation, and some other cells similar to pus-corpuscles, except that they were at least twice as large. Hasse, however, affirms that the plastic exudation contains few pus-corpuscles, whilst the opposite was the fact in one case examined by Canstatt.

Treatment.—In mild cases of croup, not preceded by bronchitic or pulmonic disease, in which the child is suddenly attacked with croupy cough and breathing at night, but where there is little or no fever, and the disease appears to be rather spasmodic than inflammatory, it is generally readily managed. An emetic should be immediately exhibited, and, for this purpose, one of the indirect emetics, or one whose emetic operation is preceded by nausea, had better be employed.

℞.—Antim. et potass. tartrat. gr. iv.
Sacchar. alb. ʒj.
Aquæ f ʒj.

Dose, a teaspoonful every quarter of an hour, until it produces vomiting; or a teaspoonful of the *vinum antimonii* or *vinum ipecacuanhæ*, or five grains of the *pulvis ipecacuanhæ* may be administered in the same manner.

The sedative effect of the nausea, and the equalizing and revellent agency of the emesis, frequently put a stop to the disease at once. The warm bath may be afterwards employed, and the child be placed between blankets; but, often, this inconvenient, though salutary agent, may be dispensed with. Warm diluents may be freely allowed. In this country, the *Hive or Croup Syrup* of Dr. J. R. Coxe has been much used in cases of croup, and is kept by many families as a regular domestic remedy for such cases. It is the *mel scillæ compositum* of the Dispensatory of the United States, and is composed of squill, seneka, tartrate of antimony and potassa, clarified honey and water. Dose, as an emetic for children, ten drops to a fluidrachm, repeated every fifteen or twenty minutes, until vomiting is induced. It is, however, a nauseous emetic, and possesses no advantage, perhaps, over the emetic articles above mentioned. It contains one grain of tartar emetic in every ounce of the mixture. By the Doctors Meigs, of Philadelphia—father and son—the sulphate of alumina and potassa is preferred as an emetic, given in the state of fine powder, mixed with honey, syrup of any kind, or molasses. The dose is a teaspoonful in an equal or double quantity of the vehicle, and repeated in ten, fifteen or twenty minutes, should the first dose fail to produce free emesis. It is recommended by them on account of its certainty and rapidity of action, and its not producing undue exhaustion or prostration. For the same reasons the Hydrargyri sulphas flavus is advised by Dr. Hubbard of Maine; but both these agents would appear to us to be better adapted for an after period of the disease, when the object is to evacuate the false membrane, and no nauseant influence is needed or advisable.

The bowels may, at the same time, be acted upon by calomel, (gr. ij.—vj.) or by any other cathartic. Calomel, however, has been administered not only as a cathartic, but as a revellent, and great reli-

ance has been placed upon it by many practitioners. With this view, it is given in the dose of from one to four grains, every hour or two, until some impression is made upon the system, when it must be gradually discontinued, prescribing it at longer and longer intervals. Usually, after it has been given for a day, and, at times, for a shorter period, its effect upon the secretions is exhibited by the altered appearance of the alvine discharges, which are of a green colour, and resemble chopped spinach. As soon as this occurs, the revellent effect of the mercury upon the constitution has been obtained, as far perhaps as is practicable, and it may be discontinued altogether, or the intervals between the doses be made progressively longer. The only danger is salivation, which is, at times, uncontrollable, and produces serious local mischief, and occasionally death. The evils from this cause, in a few instances, induced a distinguished teacher, Prof. J. Hamilton, jun., of Edinburgh, to discountenance the employment of calomel in the latter periods of his life, although, when the author attended his lectures, he was one of its strongest advocates. If the disease occur in a child under two years of age, much apprehension need not be entertained on this head, as it is extremely difficult to salivate at that age; but if the child be older than this, the effects of mercury on the system are exerted with great facility, especially if the inflammation be not very violent. In this, as in many other cases of inflammatory disease, as soon as the revellent operation of the mercury is apparent, the progress of the disease is generally arrested, and it has been inferred by Mr. Ryland, that could the subject of inflammatory croup be brought under the influence of mercury, before suffocation takes place from œdema of the glottis, or before the rima is plugged up by false membrane, the disease would almost invariably be cured. On the other hand, the mercurial treatment of croup has been characterized by Dr. Stokes as insufficient and unnecessary. It is assuredly uncertain, and liable to the occasional inconveniences that have been pointed out, but its revellent action may be efficacious. Still, it should be employed with caution, and not in the profusion advised by many authors.

Should the symptoms not yield to the emetic and warm bath,—and the difficult and peculiar breathing and cough remain the same, and especially if there be concomitant fever,—blood must be drawn either from the arm or jugular vein, or by means of leeches. There is perhaps no special advantage—as regards the removal of the disease—from bleeding in the jugular. It is the effect on the system to which we have to look; and blood should be drawn, until the pulse exhibits the effect of the agency, but short of inducing syncope. In all inflammatory diseases, this result should be avoided, as the reaction is generally proportionate to the preceding depression; but, in young children, still more caution is needed, as they sometimes do not rally after the operation. After blood has been drawn from the arm, should the case still be urgent, leeches may be applied round the neck, and their application be repeated, according to the nature of the case, and the strength of the individual.

Along with bloodletting may be conjoined the various remedies al-

ready recommended. This plan of treatment is, indeed, the one usually adopted, and found to be successful. General and local bloodletting have, however, been looked upon, by Dr. Stokes, as merely assistants to the "principal remedy," which he considers to be tartarized antimony. This he advises to be given so as to produce free vomiting, at least once every three quarters of an hour. Others have advised the same agent to be given so as to keep up a state of nausea, or of sedation, without vomiting. Both plans are unquestionably efficacious; —the equalizing and revellent agency of the emetic appearing to operate as beneficially as the sedative agency of the nauseant.

Blisters are frequently applied to the throat in the early periods of croup; but the practice is not esteemed by all to be judicious. Some, indeed, as Messrs. Stokes and Porter, have considered it to be fraught with danger. Owing to their proximity to the diseased membrane, they may add to the irritation in the larynx, whilst no revellent agency can be expected from them or from any other counterirritant. The application of a soothing cataplasm, or of a bag half-filled with hot salt, where it can be employed, is a more philosophical and successful remedy. It is asserted, indeed, by Dr. Graves, that sponging the throat and chest, with water as hot as can be borne, has been found, in many instances, capable of arresting at once all the threatening symptoms. It has also been advised to apply pounded ice to the throat; but the author is unable to say anything respecting its value from his own observation. In the impressible frame of the infant, caution ought to be exerted in the use of cold and moisture, especially where the lining membrane of the respiratory apparatus already labours under more or less inflammation.

Mr. C. Wilson, speaks in high terms of the success he has obtained from the use of tartrate of antimony and potassa as a contra-stimulant. He generally commences the treatment with the application of leeches to the larynx, which are followed by warm poultices frequently renewed; and simultaneously with the leeches, the tartrate is begun with, in doses of one-fourth or one-third of a grain;—at first, generally, every hour, until a decided impression is made, and afterwards every two hours, until the patient is considered in safety. It was usually given in the form of a mixture, with a little mucilage; and, occasionally, in older children, half a minim or a minim of the tinctura opii was added to each dose, which appeared to have a marked effect in insuring the tolerance of the medicine, without diminishing its usefulness. Along with this remedy, others—as blisters—which are generally employed, were not neglected.

In the croup of children, as in that of the adult, it has been recommended to apply the solid nitrate of silver, by means of a bent port-caustic, so as to cauterize the pharynx freely; but the recommendation has not experienced much favour. M. Hatin found it of no use after the false membrane had formed. Dr. Blakeman, of New York, has recently reported two cases in which the application of a solution of the nitrate of silver—of the strength of one drachm to a fluidounce of water—to the larynx, by means of a sponge, was productive of manifest relief, even in the early stages of the disease.

Such are the main agencies to be invoked in the treatment of the first stage of croup. A period too often arrives, when the vigorous employment of antiphlogistics can be productive of no good, and may be prejudicial. Occasionally, too, the practitioner is not consulted till there is reason to believe that the morbid formations within the larynx and trachea have actually taken place. In these cases, although leeches may be occasionally advisable, it must be borne in mind, that the abstraction of blood may enfeeble the patient without arresting the inflammation, so that he may die exhausted by the recuperative action necessary for removing the false membrane or other termination of the inflammation. The use of mercury, in the manner already pointed out, has been suggested, under the idea, that it has the power of diminishing the plasticity of the blood, and, therefore, of modifying the secretion from the lining membrane of the larynx and trachea. Its whole agency, however, is probably revellent. Liquid ammonia and the alkaline subcarbonates have been administered with the same object;[a] and it has been proposed to introduce a certain quantity of water into the vessels, with the view of diminishing the plasticity of the fluid. Dr. Caspar Morris, of Philadelphia, states that he has undoubtedly seen the alkaline subcarbonates useful; and that he has long been in the habit of adding them to expectorant mixtures with manifest advantage. It is difficult, however, to assign the precise portion of credit to individual articles in a compound prescription; and, moreover, the alkalies have not been as markedly beneficial in the practice of the author, and of others, as in that of Dr. Morris. These agents, however,—as well as various local applications to the fauces,—have been chiefly advised, in diphtheritic affections, to modify the condition of the fluid of the circulation.

[a] R.—Liq. ammon. gtt. iv.; in
Aquæ cyathum.—M.
To be taken three times a day.

In this second stage of the disease, occasional emetics are necessary to remove the false membranes from the trachea, and along with mercurials they form the main part of the treatment. In addition, blisters may be applied to the top of the chest; and should the powers fail, it may be necessary to support the system by the usual excitants, and especially by those of a more permanent character; of which, wine-whey is perhaps the best. Hot turpentine stupes may likewise be applied to the chest and extremities, "and now and then, according to Dr. Stokes, the reward of the *nil desperandum* practice may be unexpectedly obtained."

With regard to the operation of laryngotomy or tracheotomy, in cases of primary or idiopathic croup, it is generally disapproved of by authors. The operation, in rare cases, has succeeded, but, in almost all, it has been unsuccessful; and when we bear in mind, that fatal cases never occur without the bronchial tubes lower down being affected with the malady, we can see the reason why it is so rarely attended with success. It is likewise a serious objection to the operation, that the struggles of the patient, the constant motion of the larynx upwards and downwards, and the hemorrhage, apt to take place from

the hyperæmic condition of the thyroideal veins, render it extremely difficult. In a discussion, which took place at the *Académie Royale de Médecine*, of Paris, the following was given as the ratio of success with the different celebrated practitioners, whose names are mentioned:

	Operations.	Cures.	Deaths.
M. Amussat,	6	0	6
Baudelocque,	15	0	15
Blandin,	5	0	5
Bretonneau,	18	4	14
Gerdy,	6	4	2
Roux,	4	0	4
Trousseau,	80	20	60
Velpeau,	6	0	6
	140	28	112

Since then, the number of cases in which M. Trousseau has performed the operation of tracheotomy in croup, has been stated to be 109; of which 25 are said to have been successful. M. Petel, of Cateau, has likewise reported six cases in which he practised the operation: three of these recovered, although five days had elapsed in one, and ten in another, from the commencement of the disease, and the patients were almost in *articulo mortis;* and another case communicated to the *Académie Royale de Médecine* of Paris, by M. Maslhieurat-Legrand, and reported upon by M. Bérard, would seem to show, that the operation may be properly attempted when life appears to be almost extinct. When it was completed, the infant seemed dead, and was resuscitated by maintaining artificial respiration for upwards of twenty minutes; and in another case, recorded by M. Trousseau, the patient had apparently breathed his last a few moments before the commencement of the operation. "Tracheotomy was, however, performed, apparently, as it were, on the dead subject, and artificial respiration was kept up by means of alternate compression of the thorax: after the lapse of a quarter of an hour, the heart was felt to pulsate, and at the expiration of fifty-seven minutes, the features moved, and a deep inspiration was made. Respiration was gradually re-established, and the patient was restored to life." On the other hand, during the year 1841, according to M. B. A. Becquerel, tracheotomy was performed at the Children's Hospital of Paris nine times; and all the cases terminated unfavourably. In Philadelphia, according to Dr. Caspar Morris, it has been uniformly without success. "In one case, Dr. Rhea Barton, at the earnest solicitation of the physicans and friends, performed the operation when the child was apparently in *articulo mortis.* The first access of air to the lungs produced effects as wonderful as those of galvanism. What had been apparently a corpse looked round on its parents embraced them, and, I believe, talked. It soon, however, sank again into the stupor of death, and crushed the hopes which had been so highly excited." It is important also to remark, that M. Valleix has collected 54 published cases, in which the diagnosis was, in his opinion, unequivocal; being characterized by aphonia, whistling respiration, (*respiration sifflante*) and the expulsion of membranous shreds, or their presence in the larynx after death; and of these seventeen recovered without any operation; a

proportion nearly equal to that which—he considers, with M. Bricheteau —applies to the recoveries after tracheotomy,—that is, almost one in three. He does not pretend to give this as the ratio of cures under such circumstances, without tracheotomy; inasmuch as it is well known, that cases of cure are eagerly made public, whilst fatal cases are most commonly passed by without notice. He properly remarks, however, that it is a matter not devoid of importance to show, that well-attested cases of cure of pseudo-membranous laryngitis are more numerous than has been supposed by M. Guersant, who affirms, that cures are very rare in the second stage, and can scarcely be expected in the third. Dr. Charles West, too, thinks, that the results recorded by M. Trousseau are not more favourable than those obtained by purely medical treatment.

A few words are necessary as to the treatment of the *Croup of the Adult*, which, as has been seen, is secondary in its character, and connected with the same diphtheritic habit that gives occasion to diphtheritic stomatitis and diphtheritic pharyngitis. The remarks as to pathology and therapeutics, made under the latter disease, are equally applicable to diphtheritic laryngotracheitis. Mercury, administered so as to affect the system, has been given with the same views as in primary croup—that is, to diminish the plastic tendency in the blood; and cases are on record, in which very severe diphtheritis of the air-passages appeared to have been cured by it. Great reliance has, however, been placed on the topical applications recommended in diphtheritic pharyngitis, and especially on the muriatic acid, nitrate of silver, alum, the sulphuret of potassium, and the muriate of ammonia, applied in the manner directed under CHRONIC LARYNGITIS. Tracheotomy has likewise been advised in cases of diphtheritic laryngotracheitis, when urgent symptoms arise, which threaten suffocation. Perhaps, in such cases it might be more serviceable than in primary croup, in which there is so frequently a combination of bronchial and pulmonary inflammation. It has been proposed, with another view likewise,—to introduce through the aperture the local applications that have been found so useful in diphtheritic pharyngitis and laryngitis. Fragments of the membraniform exudation are occasionally expelled through the opening, and through it agents, as calomel, have been introduced to act on the morbid surface. Eight grains of calomel, introduced in this way by M. Bretonneau, appear to have afforded marked relief in one case. Powdered sugar and powdered alum have been blown into the larynx through the aperture in the same manner. MM. Bretonneau and Trousseau have advised two processes in such cases—sponging or mopping (*écouvillonnement*), and cauterization. The former appears to be sufficiently formidable to deter many from its employment. It is executed by means of two instruments, one a thin flexible piece of whalebone, terminated by a sponge; the other a rod, to which a small brush is attached, similar to that used for cleansing bottles. The lips of the wound in the trachea being kept open by means of a dilater, M. Trousseau advises, that half a spoonful of water should be injected through the canula, and then that the *écouvillon* should be passed in to the

depth of 15 or 18 *centimètres*,—In. ·589 to ·707. In this manner he sweeps (*ramone*) the trachea for two or three seconds, and repeats the operation ten, twenty, to even forty times, expecting to detach the false membranes, draw them outwards, and, at the same time, to modify the condition of the exhalant surface. Cauterization is practised by a solution of nitrate of silver (*Argent. Nitr.* gr. iij., *Aquæ* f 3j.) dropped into the larynx and trachea. He prefers, however, applying the caustic immediately to the affected parts by means of the mop (*écouvillon d'éponge*) dipped into it (one part of *nitrate of silver* to four parts of *water*). Lastly, M. Trousseau instils a few drops of warm water, to soften or dissolve the mucus and false membranes. After these difficult *manœuvres*, some of the concretions are expelled; an appropriate canula, the orifice of which is at least the size of the normal orifice of the glottis, is then placed in the trachea, and retained *in situ* by means of two tapes, care being taken that it does not become displaced or obstructed. In the latter case, it is withdrawn, cleansed, and replaced, after a fresh *écouvillonnement*. After the operation is concluded, the patient's strength must be supported; the canula must not be withdrawn until the false membranes have been completely expelled, and the air passes freely through the aperture of the glottis. Such is the plan followed by M. Trousseau, and by which he has succeeded in saving so many—25 in 119. "The ratio of cures," says M. Grisolle, "is truly enormous when it is considered, that the patients, when the operation was performed, were almost given up to certain death."

Topical applications to the interior of the larynx are not, however, much employed.

III. SPASM OF THE GLOTTIS.

a. *In Children.*

Synon. Laryngismus stridulus, Asthma spasticum Infantum, A. laryngeum Infantum, A. infantum spasmodicum, A. Intermittens infantum, A. dentientium, A. periodicum acutum, Apnœa infantum, Spasmus glottidis, Asthma Thymicum Koppii; Cynanche trachealis spasmodica, Asthma acutum Millari, Crouplike inspiration of infants, Child crowing, Crowing spireration, Spasmodic croup, Pseudo-croup, Spurious croup, Millar's Asthma, Cerebral croup, Suffocating nervous catarrh, Thymic asthma, Koppian asthma; *Fr.* Laryngite striduleuse, Faux croup, Asthme aigü de Millar; *Ger.* Millar's hitziges Krampfasthma, Juchkrampf, Juchkränkte, Athemeinhalten, Ausbleiben.

This disease was known to the older writers, but the first accurate description of it was given by Dr. J. Clarke, under the designation of a *peculiar species of convulsion in infant children*. Of late years, it has attracted more attention, and by many of the German and other writers, has been termed, in consequence of their views of its pathology, *Asthma thymicum*, and *Asthma thymicum Koppii*,—M. Kopp having first directed attention to the thymus as concerned in its production.

Diagnosis.—Spasm of the glottis is so alarming in its character, that it immediately excites the attention of parents. It consists, essentially, in a diminution of the aperture of the glottis, so that the respiration is occasionally arrested for a moment; and after violent efforts, the child succeeds in drawing its breath, with a sound approximating to that of croup or hooping-cough, occasioned by the very narrow chink through which the air passes. After a time, the attack ceases, and

the child remains in its ordinary health; but sooner or later, the disease returns; at first, the child waking out of sleep in one of them, but subsequently, the fit occurs whilst it is awake. The intervals between the paroxysms are at first considerable, but they become less and less, until frequently the child scarcely recovers from one, before it is attacked with another. During the paroxysm, the face often becomes swollen and livid, and the veins filled with black blood. At various intervals, from a few seconds up to a minute, or at times nearly two minutes, air is at length admitted through the glottis, passing through the contracted rima glottidis, and giving occasion to the peculiar crowing sound. "To these symptoms," says Dr. Ley, "not unfrequently succeeds a fit of coughing or crying, which terminates the scene; or, if the glottis be not even thus partially open, the child at the end of from two to three minutes, at the utmost, will die of asphyxia; pallid and exhausted, it falls lifeless upon the nurse's arm, and it is then that the child is generally said to have died in a fit."

Either just before, or for some time after, a paroxysm, the noise of the patient's breathing is that which an increased secretion of mucus in the air-passages would produce. This symptom is rarely absent, and communicates to the affection the appearance of catarrh, and especially of the *catarrhus suffocativus*, by which name it has been known by some. Sooner or later in the disease, the hands and feet become slightly swelled, and the fingers and toes rigid, the thumb being frequently drawn forcibly into the palm of the clenched hand. It is not, however, the flexor muscles that are alone affected. The spasm has been observed in the extensors, producing a permanent spreading and extension of the fingers, which has been considered by Dr. Maunsell to denote a less serious lesion of the nervous system than the opposite condition. The presence of these symptoms has given occasion to the names *Carpo-pedal spasm*, *Cerebral spasmodic croup*, and *a spasmodic affection of the chest and larynx in young children, accompanied by general or partial convulsions.* By the generality of writers, it is conceived, that there is a natural association of the disease with the convulsions, but it may exist without them.

As to the prognosis, great variety of sentiment has existed. Whilst some have esteemed it an affection of the most serious nature, it has been maintained that it is rarely fatal, and others think it will generally yield to proper remedies. It is certainly alarming, and very frequently destroys. The author has known several children in the same family die in succession when they attained the same age.

Causes.—The fact just mentioned shows, that a predisposition to the disease is laid in organization, a circumstance which has been proved by other observers. Age offers another predisposition. Although it has been met with at a later period, the large majority of cases occur before the termination of the first dentition. It would seem, likewise, to be a complaint of damp situations and seasons. In this country, it is very rare. Almost all writers agree, that it occurs generally in those of the strumous habit.

Among the exciting causes, must be ranked powerful mental emotion, improper feeding, and anything that can over-excite the nervous

system or any part of it. In one case, seen by Dr. Marsh, a paroxysm was induced whenever the child was brought back to a newly-painted house.

Pathological Characters.—We have much still to learn on this interesting subject; and the proof of this is, that, even at the present day, different opinions exist as to its nature. It has been thought to be, in the first instance, a spasmodic affection of the muscles of the glottis; and that not until the disease has increased in severity, and general convulsions have arisen, does the brain or its meninges become the seat of disease. The seat of the primary lesion has been presumed to be at the origin of the pneumogastric nerve. By others, it has been supposed to be in the brain. By others, again, the disease has been referred to hypertrophy of the thymus gland, producing pressure upon the heart, lungs, and great vessels; and, lastly, it has been maintained to be owing to the enlargement of the bronchial or deep-seated lymphatic ganglions of the neck, pressing on the recurrent nerves, and inducing paralysis of the muscles supplied by them.

This last view, consequently, differs from those usually embraced, in regarding the affection to be more allied to paralysis than to convulsive movement. Before Dr. Ley's work appeared, it was generally believed to be spasmodic; and, in the opinion of most writers, the spasm of the muscles of the larynx was owing to the existence of cerebral disease, usually of an inflammatory character. As a general rule, however, when the affection of the glottis has occasioned death at an early stage, no pathological appearances have been perceptible in the brain or its meninges; and when such appearances have existed, numerous attacks of spasm have occurred, so that the cerebral lesions have often, certainly, been secondary. Still, judging from the character of the phenomena, the disease must be primarily and essentially encephalic; and it has been suggested by Dr. Marshall Hall, that even the enlargement of the thymus gland, which is sometimes met with, may be a "natural effect of the violent convulsive efforts observed in this terrific malady." Under this morbid state of the encephalon, excentric irritation may be conveyed through the afferent nerves—the pneumogastric, fifth, and spinal nerves, for example—and be reflected upon the laryngeal nerves. The views of Kopp and other German pathologists, that enlargement of the thymus gland gives rise to convulsions and sudden death was from the first questioned by the French pathologists, and recent researches of M. Trousseau have satisfied him that there is no such disease; and that the affections described by them were merely illustrations of partial convulsions. During six years that he has been at the head of important wards for very young children, he has not once met with the thymus gland sufficiently enlarged to give rise to the slightest accident.

Treatment.—This has varied according to the pathological views of the practitioner. Where the disease seems to be complicated with difficult dentition, derangement of the digestive apparatus, and with marks of a strumous habit, the gums, if a tooth be pressing forward, must be freely divided; the diet regulated; and free exposure to pure air be recommended, with the various agents that are advised, when

dentition is accompanied by morbid derangement. Dr. Marshall Hall, indeed, advises, that the gums should be repeatedly and freely divided, without reference to whether teeth are coming through or not. He employs division of the gums during dentition, to correct a state of the blood-vessels and nerves, which, though physiological, borders on a pathological character. "I have prescribed it," he says, "to be used daily. I have been satisfied with nothing short of the subjugation of the excessive action and fulness of the vessels, and of the disappearance of morbid actions, chiefly of a nervous character, in distant parts." The head affection—should it exhibit itself—must be treated by the rules laid down under diseases of the encephalon. The exciting causes, too, must be removed whenever this is practicable.

Such would seem to be an outline of the general principles of management that are applicable to most cases of the disease:—an outline, which will have to be filled up by the practitioner, according to the indications presented by the individual case.

Should enlargement of the thoracic or cervical lymphatic ganglions exist, which, we are told by Dr. Ley, is the fact in nineteen cases in twenty, the cause of the enlargement must be investigated, and if it be owing to bronchitis, cutaneous affections of the scalp, or scrofulosis, they must be first removed, if practicable. If the glandular enlargement be active, and there be a tendency to suppuration, this must be encouraged, and the abscess be opened as early as possible: on the other hand, if it be indolent, its absorption must be attempted by iodine, or its salts, administered internally or externally, or both. The neck and upper part of the sternum may be rubbed, morning and evening, with an ointment of iodine,[a] and the solution of iodide of potassium, (gtt. iij. ter die,) or of the iodide of iron, (gtt. iv.—vj.), which is generally preferable, in consequence of the defective nutrition, that always accompanies, or rather forms scrofulosis, may be given, gradually increasing the dose.

[a] R.—Potass. iodid. p. j.
Cerat. simpl. p. viij.—M.

The two great remedies, relied upon by Dr. Merriman in this malady, are soda and burnt sponge—the latter of which owes its main efficacy to the iodine which it contains. The soda prevents the predominance of acidity, so fruitful a source of the bowel complaints of children, and the burnt sponge is one of our best agents for inducing a modified condition of the function of nutrition.

The believers in the existence of hypertrophy of the thymus, as a cause of the disease, advise that all undue congestion and nervous excitement in the heart and lungs should be diminished, and prevented by low diet, large and frequent local bleedings every four or eight days, blisters and issues on the chest, constant active cathartics, &c., and that the hypertrophy of the thymus should be diminished by mercury, iodine, &c. The practitioner should, however, be careful in a disease, unquestionably associated, in most cases, with scrofulosis, not to reduce the system so far as is inculcated by this view of its pathology.

Great advantage has arisen from the revulsion afforded by change

of air in chronic cases, especially by removal from a cold and moist to a warm and dry air. Such, at least, is the general belief; and it is a result which might be anticipated. It has been deprecated, however, by Dr. Mackintosh, who exhibits in his works too many evidences of a desire to be singular in his sentiments. He remarks, that change of air is said to have worked wonders;—that he has seen it beneficial when the child was removed from a cold, bleak situation, to a milder and more sheltered spot, but that he has "more frequently observed change of air hurtful."

In regard to the treatment during the paroxysm, little need be said, as it is commonly ended before the practitioner can be called. Nothing more can be done than to place the child in the erect or sitting posture; to use friction along the spine; to admit cold air freely into the apartment; sprinkle cold water on the face, and apply ammonia to the nose, so as to induce crying, or sneezing, or some strong form of expiration, during which the glottis is opened, and the paroxysm terminates. A case of very severe laryngeal spasm has been recently reported by Mr. Image, of Bury Saint Edmonds, England, which was likewise seen by Dr. Ranking: in it benefit was derived by inhalation from a sponge saturated with ether. If the fit do not yield to such remedies, vomiting may be excited, and friction used over the body, or the child may be placed in the warm bath. The case of a child, two years old, has been narrated by Dr. Marsh, in which very frequent attacks, complicated with general convulsions, were stopped, and suspended for a month, after the administration of a tobacco enema, (five grains of the leaves to an ounce of water;) and Dr. G. B. Wood affirms, that one of the worst cases of spasm of the rima glottidis, which he had seen, and which had resisted powerful depletion by the lancet, yielded to the application of a tobacco cataplasm to the throat. The following mixture, recently advised by Dr. Reed, is capable of effecting as much good as any of the agents termed antispasmodic, which are all of indirect and limited agency; but the formula may be varied at pleasure. Should none of these agents succeed, the operation of tracheotomy has been suggested; but this ought scarcely to be performed, unless the child is in a state of asphyxia, when every effort should be made to inflate the lungs, and restore the breathing. Among the agencies, in this view, tracheotomy is one of the most important.

℞.—Sp. ammon. fœtid. f℥ss.
Acid. hydrocyan. ℥v.
Tinct. hyoscyam. ℥vij.
Spirit. anis. f℥i.
Syrup. aurant. f℥ss.
Aquæ f℥iss.—M.
Dose, a teaspoonful, twice or thrice daily.

The child, that is liable to such attacks, should be warmly clad, and protected, as far as practicable, from vicissitudes. The diet, too, should be the breast-milk, whilst it is at the breast; and, if not, cow's milk, diluted with two-thirds of sweetened water, or with weak arrow-root.

b. *In Adults.*

Spasm of the glottis, occurring in the adult, owing to pressure on the larynx and trachea, or on their nerves, has been separated from spasm of the glottis of children, by Mr. Ryland, although the symptoms, causes, &c. are much the same. In the adult, however, the affection is secondary: whilst in the child, this is doubted by many, although maintained, as has been seen, by some. The disease, in such cases, may arise either from irritation of an inflammatory nature, in the immediate vicinity of the larynx; from foreign bodies in the œsophagus; from bronchocele; from aneurism of the arteria innominata, &c. &c., all of which must be diagnosticated by the appropriate rules. The prognosis is of course, unfavourable, inasmuch as it merges in that of the original affection, which is often irremediable. The great object is, by every care, to prevent the recurrence of the paroxysms of suffocation, by avoiding every source of mental and corporeal agitation. Perfect quiet, an inclination of the body forwards so as to favour the respiratory efforts, the warm bath, with opiates, or the inhalation of ether, may be recommended during the continuance of the paroxysm.

In hysterical females, a spasmodic affection of the laryngeal muscles is by no means unfrequent, giving rise to what has been termed "*hysteric croup.*" The paroxysms consist of a long-protracted, loud and convulsive cough, followed, at times, by the crowing inspiration, and by dyspnœa so great as to threaten suffocation. This state may continue for two or three hours, until the patient faints, or a decided hysterical attack supervenes.

The **Treatment** is that recommended for hysteria. During the paroxysm, new impressions must be excited by cold water thrown over the face and neck; or by *the douche* from the spout of an ordinary teapot. In such a case, the inhalation of ether is clearly indicated; or the aromatic spirit, or the carbonate of ammonia, may be held to the nostrils; and when the patient is able to swallow, the various remedies advised for hysteria may be administered. In one case, creasote[a] was used with much benefit as an inhalation by Dr. Herndon, of Virginia.

[a] R.—Creasot. gtt. xxx.
Aq. fervent. Oij.—M.

IV. MORBID PRODUCTIONS IN THE LARYNX AND TRACHEA.

a. *Hypertrophy of the Cartilages.*—The different cartilages of the larynx and trachea may become hypertrophied, but no inconvenience results from this, provided the mischief does not proceed far; but if it occasion narrowness of the larynx, all the signs of suffocation may ensue. During life, there is a constant sense of constriction in the larynx, and progressively increasing dyspnœa; and, on dissection, the cause of the symptoms is apparent. If the hypertrophy be accompanied by tenderness on pressure, leeches may be applied over the affected part, and an ointment of iodine[a] be rubbed in, night and morning.

[a] R.—Iodin. gr. v.
Adipis. ʒij.—M.
Quantity for each friction, half a drachm.

b. *Ossification of the Cartilages.*—This is a natural result in the aged, in whom the various cartilages of the larynx are always more or less ossified—a change which does not produce any inconvenience, unless they become hypertrophied, when the phenomena may occur, which have been described above. When entirely ossified, they are said to have caused death by occasioning total dysphagia; but this must be a very rare case. The arytenoid cartilages are seldom ossified, but they have been found so. The cartilages of the trachea are likewise often ossified in the progress of life without any evident symptoms arising.

c. *Tubercles.*—These are sometimes met with in the mucous membrane, but scarcely ever except where the individual is, at the same time, affected with phthisis. When they occur primarily in the larynx, they may undergo softening, and give rise to all the phenomena of chronic laryngitis.

d. *Polypoid and other Tumours*, &c. &c.—The polypoid tumours, which form in the larynx and trachea, are similar to those of other mucous membranes. Their presence is not indicated by any pathognomonic signs, and, therefore, they are not detected until after death. They are generally found above the inferior ligaments of the larynx, and are attached by a pedicle either to the ventricles of the larynx, or to the ligaments.

Tumours of other kinds have likewise been found, on dissection, in the larynx, and *calculous concretions* and *hydatids* in the ventricles.

V. FOREIGN BODIES IN THE LARYNX AND TRACHEA.

Ger. Fremde Körper in den Luftwegen.

When any foreign substance passes into the larynx of an adult, there is rarely difficulty in the diagnosis, inasmuch as the history of the case is sufficiently known; but in children, there is not the same facility; and cases of foreign bodies, impacted in some part of the air passages, have, doubtless, often been mistaken for spasm of the glottis, and croup.

Diagnosis.—As soon as the extraneous substance has passed into the larynx, it gives rise to a train of symptoms extremely like those of croup, but differing somewhat, according to the size and character of the substance, and the part of the air tubes, in which it may be situate; according, for example, as it is in the larynx, the trachea, or bronchial tubes. In the majority of cases, where it is in the last situation, it is in the right bronchium, either owing to the greater size of that tube or to the anatomical arrangement of the trachea at its bifurcation directing the substance into it, or to both. The projection or septum, which divides the right and left bronchium, is not in the mesian line, but to the left of it, so that, as remarked by Dr. Stokes, this direction is naturally taken by the extraneous body. As soon as the foreign body has reached the larynx, and especially if it remain there, the symptoms are violent and distressing, this part of the windpipe being

possessed of more irritability than lower down. The child is suddenly attacked with violent spasmodic cough, croupy breathing, pain in the region of the larynx, and paroxysms of suffocation, in which the dyspnœa has been observed to be greater during expiration than during inspiration. The case may terminate fatally from mechanical obstruction, or the substance may pass through the rima glottidis into the trachea, after which relief is obtained, which is, however, but temporary, and is, generally followed by inflammation of the bronchial tubes, or of the pulmonary tissue, of an acute or chronic character. The most favourable event is the expulsion of the foreign body from the mouth, after which the symptoms speedily yield, except where its presence has given rise to serious bronchial or pulmonary mischief, under which the patient may succumb.

If a child have been previously in perfect health, and been playing with some small article, after which it is attacked with the violent symptoms described above, the presumption will be, that the article has passed into the windpipe. The physical signs, which throw light on the case, are as follows:—If the foreign body be still in the larynx, and no disease have supervened in the lung, the sound rendered on percussion and auscultation of the chest may be as in health: the respiratory or vesicular murmur will be everywhere clearly distinguishable. When the extraneous substance is movable in the trachea, its motion up and down may be occasionally heard, as well as a valve-like sound, produced by its being violently driven in expiration against the rima glottidis. This, however, is not included by all among the physical signs; farther observations being considered necessary to establish it. If the foreign body have passed down into one of the bronchia, the physical signs are more valuable. In such case, it may either have obstructed the bronchium completely, or imperfectly. Hence, the respiratory murmur in the corresponding lung is either greatly diminished, or altogether gone, whilst the sound on percussion remains the same; and the opposite lung—into which the whole of the air must now pass—exhibits the puerile respiration. When the foreign body passes up from the bronchium into the trachea, the respiratory murmur will be again heard in the affected lung. In an interesting case, in which a half sovereign was lodged in the right bronchium of a distinguished English engineer—Mr. Brunel—for a period of thirty days, no particular sounds, according to Sir B. Brodie, were detected by the stethoscope.

Treatment.—Emetics have been advised, with the view of causing the expulsion of the body, and where it is small, they may be of service. As it is the mechanical succussion, which is needed in such cases, the direct emetics are capable of accomplishing all that the others can, whilst they operate much more speedily. The sulphate of zinc, may, therefore, be given, (gr. vj. dissolved in water, to a child,) or the throat may be tickled with a feather. Should this fail, recourse must be had to tracheotomy, and it must be borne in mind, that the earlier it is practised, the greater will be the safety of the patient. Many cases are on record, in which it has been employed with full success.

The case of Mr. Brunel, referred to above, is so interesting in all its relations, as to deserve farther notice. On the 3d of April, 1843, whilst amusing some children, a half sovereign, which he had in his mouth, accidentally slipped into the windpipe. The symptoms which succeeded were principally occasional severe fits of coughing, and a sense of pain referred to a part of the chest corresponding to the situation of the right bronchium. The patient was able to pursue his ordinary avocations, and made two journeys into the country. On the 19th of April, having placed himself in a prone position, with the stomach resting on a chair, and the head and neck inclined downwards, he had a distinct perception of a loose body slipping forwards along the trachea: a violent convulsive cough ensued; and, on resuming the erect posture, he again had the sensation of a loose body moving in the trachea towards the chest. An apparatus of the following kind was now constructed. A platform on which the patient could lie prone, was made to move on a hinge in the centre, so that one end of it being elevated, the other was correspondingly depressed. On the 25th of April, Mr. Brunel was placed on this apparatus with his shoulders and body fixed by means of a belt, and his head was lowered to an angle of nearly 90° with the horizon. His back was then struck several times with the hand, but violent fits of choking were brought on each time, and it was not deemed prudent to continue the experiment. On the 27th, it was agreed in consultation to make an opening into the trachea, between the thyroid gland and sternum. In proposing this, the object was twofold—*first*, that an attempt might be made to extricate the coin with the forceps: *secondly*, that if relief could not be obtained in this manner, the artificial opening might serve the purpose of a safety-valve, and the experiment of inverting the body on the platform be repeated without the risk of inducing suffocation. The operation having been performed, several attempts to remove the coin were made, but unsuccessfully; and on each introduction of the forceps, paroxysms of convulsive coughing of such a violent character were brought on, that the attempts could not be persevered in without danger to life. On the 2d of May, a renewal of these trials was followed by the same results. On the 13th, the wound in the trachea having been kept from closing by the occasional introduction of a probe, the patient was again placed on the movable platform; his back was then struck by the hand; two or three efforts to cough followed, and presently he felt the coin quit the chest, striking almost immediately afterwards against the incisors of the upper jaw, and dropping out of the mouth. No spasm of the muscles of the glottis took place; a small quantity of blood was ejected at the same time, apparently proceeding from the granulations of the external wound. From this time the recovery of the patient was rapid.

More recently, a case has been published by Dr. James Duncan, Surgeon to the Royal Infirmary of Edinburgh, of a man, who was amusing himself with tossing up a shilling and catching it in his mouth, when it slipped into the larynx. At first, violent coughing with great dyspnœa was produced, but these symptoms after a time subsided.

From the favourable result in Mr. Brunel's case, it was determined to try inversion of the body,—a plan which had occurred, by the way, to the patient himself. Instruments were, however, kept in readiness to perform tracheotomy, should the coin change its position so as to produce suffocation. The man was placed with his shoulders against the raised end of a pretty high sofa, and then being seized by the loins and thighs by three of the most powerful of those present, he was suddenly inverted, so as to bring the head downwards; and after a shake or two,—an assistant, at the same time, moving the larynx rapidly from side to side,—the shilling passed into the mouth, and fell upon the floor. Not the slightest cough or dyspnœa was excited, and the patient immediately started up, delighted with the result.

It may admit of question, however, whether in all such cases the trachea ought not to be opened before the inversion of the body is practised, as fatal suffocation might result by change of position of the coin.

CHAPTER II.

DISEASES OF THE BRONCHIA AND LUNGS.

I. INFLAMMATION OF THE BRONCHIAL TUBES.

Synon.—Bronchitis, Inflammatio bronchiorum, Angina bronchialis, Bronchostasis, Catarrhus pulmonalis seu pulmonum, C. bronchiorum seu bronchialis, Bronchocatarrhus, Destillatio pectoris, Pleuritis humida, P. bronchialis, Pulmonary catarrh; *Fr.* Bronchite, Inflammation des Bronches, Rhume de Poitrine, Fièvre Catarrhale; *Ger.* Entzündung der Luftröhrenäste, Bronchialentzündung, Entzündung und Katarrh der Bronchien, Bronchial katarrh, Brustkatarrh, Lungenkatarrh.

Inflammation of the bronchial tubes, like other inflammatory affections, admits of two well-founded divisions, the *acute* and the *chronic;* and the former may be subdivided into the *ordinary acute*, and the *epidemic form.*

a. *Acute Bronchitis.*

Synon.—Bronchitis acuta, sthenica seu synochalis.

1. *Ordinary Acute Bronchitis.*

Not many years ago, bronchitis and *catarrh* or *pulmonary catarrh* were generally separated from each other; but by most modern pathologists, they are usually classed together, although the latter may not be confined to the mucous membrane of the bronchial tubes, but may extend along that of the trachea, larynx, and indeed of the pharynx and nose; constituting, in the nose, *a cold in the head*, *coryza* or *nasal catarrh;* which, when confined there, it need scarcely be said, cannot be regarded as bronchitis, by any forced extension of the term and has, therefore, been treated under another head. The French, again, and, in certain cases, the British pathologists also, have usually separated *catarrh* from *pulmonary catarrh*, applying the former term to an increased secretion from any mucous membrane;—thus, a defluxion of mucus from the intestines has been termed *catarrhus intestinorum*—from the bladder, *catarrhus vesicæ*, &c. It is of great moment, however, to abolish terms, which are employed with different significations, and hence there is advantage in considering the pulmonary catarrh, as synonymous with bronchitis.

The milder forms of bronchitis, constituting what is commonly called *a catarrh*, are familiar to all, as no one passes through life without being affected by them. They are generally, however, easily managed, and commonly receive no medical attention whatever.

Diagnosis.—As the inflammatory or other irritation of the lining membrane of the nose is indicated by sneezing, so is that of the bronchial tubes by cough; both being owing to the reflex nervous action, which gives occasion to a convulsive respiratory effort on the part of certain muscles, to drive the air rapidly through the air-passages, and thus sweep away from the mucous membrane any source of irritation that may exist there. Cough, consequently, in these affections, is a mere symptom, although of old it was regarded as a distinct

morbid condition. In the first instance, the cough is dry, in consequence of the earliest effect of inflammation of mucous membranes, being to diminish or arrest the discharge from them; but this state soon passes away, and the mucous follicles secrete a larger quantity than in health, and a fluid of an abnormous character; this pathological state resembling, again, the common cold in the head, in which the nasal mucous membrane is first of all devoid of its ordinary secretion, but soon secretes an unusual quantity of a thin mucus. It is this condition, when accompanied by more or less hurry and oppression of breathing, and some degree of febrile movement, we understand by the term *common catarrh.*

When the inflammation of the bronchia is to a greater degree than this, a deep-seated pain is experienced in the thorax, with a sense of heat under the sternum; frequent cough, at first dry; difficulty of breathing, and excitement of the circulatory function in a ratio with the degree of the inflammatory action. More or less headache is generally experienced, especially after the fits of coughing; and if the inflammation be considerable, the face is red and tumid; the appetite gone; there is more or less thirst; the tongue is white; and the mouth clammy. At times, the fits of coughing occasion vomiting, and there is commonly, as in most febrile and inflammatory affections, an increase of the symptoms towards evening. Occasionally, too, the bronchitis is accompanied by phlegmasia of other mucous membranes, and there is a protracted febrile indisposition, to which the name Catarrhal Fever has been given, although the term is often used synonymously with acute bronchitis. In severe cases, the cough is violent, and recurs in paroxysms, occasioning a severe pain and sense of laceration, which is often referred to the lower portion of the sternum. The pain shoots with violence from the ensiform cartilage to the back; and, owing to the exertion in coughing, the various muscles of the chest and abdomen are painful on pressure. About the second or third day of the disease, the cough, which had been previously dry, becomes more moist, and a thin, frothy secretion is expectorated, with more or less difficulty;—the sputa gradually become more copious and consistent, viscid and ropy; and, at length, are thicker, more opaque, and less in quantity. Towards the termination of the disease in health, they become white, yellow, or, more frequently, of a gosling-green colour; and, if expectorated into water, they are suspended at or near the surface. Occasionally, pus is united with the mucus of bronchitis. The author had a case of measles under his charge, in which the quantity of pus secreted by the bronchial mucous membrane was surprising: the physical signs showed satisfactorily, that there was no cavity. At times, also, the matter of expectoration is streaked with blood; and cases have occurred in which it has been tinged with bile. In other cases, a pseudomembranous secretion is expectorated, which has the shape of the bronchial tubes, and generally requires violent efforts of coughing to separate and expel it. To this form of the disease the names *Bronchitis membranacea*, *Plastic bronchitis*, *Bronchial polypus*, *Bronchial croup*, and *Pseudo-membranous Bronchitis*, have been given.

Bronchitis may be confined to the larger tubes: but occasionally it extends to the smaller, constituting CAPILLARY BRONCHITIS, *Bronchitis capillaris*, Fr. *Bronchite capillaire*, Ger. *Capilläre Bronchitis*, the occurrence of which is announced by more or less severe symptoms, such as extreme oppression, supervening at times very suddenly, with great acceleration of the respiratory movements, especially in children; frequent paroxysmal cough, causing lacerating pain behind the sternum,—with the ordinary physical signs of acute bronchitis.

If the attack of bronchitis be severe, and accompanied by much inflammatory fever, the urine is scanty, of a dark red colour, strongly acid, and of a high specific gravity. M. Becquerel observed an appreciable amount of albumen in such cases. The urine deposited a sediment, and had a mean specific gravity of 1025·2. During convalescence the urine either returns to the normal state, or assumes the "anæmic type" of M. Becquerel,—that is, it is pale, of low specific gravity, and deficient in solid constituents, especially in urea. In milder forms of acute bronchitis, M. Becquerel found the urine highly coloured, sometimes depositing a sediment, and of a mean specific gravity 1024·3. In the mildest forms, the urine scarcely deviates from the normal condition. (*Simon.*)

The physical signs of bronchitis are negative rather than positive. Percussion renders a clear sound over every part of the thorax, unless there is a very considerable accumulation of mucus in the bronchia,—which indicates that there is nothing like morbid deposition or consolidation. Auscultation indicates a sibilant or whistling, dry rhonchus or *râle*, exhibiting thickening of the mucous membrane, and consequent narrowness of the tubes; and, at a later period, when the mucous secretion has become increased, the mucous *râle* is heard. The respiratory murmur is commonly heard everywhere; but, on careful examination, it may be found momentarily absent in certain parts, which is attributable to the bronchial ramifications being obstructed by the secreted mucus, or by a plastic secretion; and, as soon as this is expectorated, the respiratory murmur is observed to return.

The duration of the disease varies; but the average may be reckoned at from one to two weeks.

Mild cases of bronchitis—those commonly classed under the head of *Catarrh*—almost always terminate favourably. The same may be said of the majority of cases of simple acute bronchitis; but, occasionally, owing to the extension of the inflammation to the small bronchial subdivisions, and to its narrowing the tubes and filling them with mucus, death takes place from asphyxia. The prognosis of capillary bronchitis is, indeed, always serious. M. Grisolle affirms, that it carries off a sixth part of the adults, and seven-eighths of the children who are attacked with it. In children, however, he properly observes, it must not be forgotten, that capillary bronchitis is frequently complicated with lobular pneumonia, which is the cause of fresh danger. General capillary bronchitis is, according to M. Valleix, emphatically a disease of childhood. His own experience for three years at La Salpêtrière, and his inquiries in regard to

the experience of others, furnished him with only five unequivocal cases of the affection in adult and advanced life. The symptoms of this by no means unfrequent and alarming disease in children, are well described by the writer just mentioned. In general, it commences as a common cold of variable severity; when, at the posterior and inferior part of the chest on both sides, as in bronchitis, a subcrepitant rhonchus may be discovered extending up one-third or one-half the height of the thorax. These symptoms soon assume great intensity; and the little sufferer presents the following phenomena. The face is pale; the lips have a violet hue; the eyes are prominent; the countenance is extremely anxious; the nostrils are dilated at each inspiration; and the child is agitated and restless. Older children and adults sit and incline the head forward, or raise it by resting on their elbows. There is likewise panting, with violent dilatation of the chest, and, at intervals, the breathing is sonorous and stertorous, but more tranquil after expectoration. The cough is violent and moist, recurring frequently in paroxysms, but it does not possess any peculiar character. In very young children, there is no expectoration; in others, difficult expectoration of a matter more or less consistent, not frothy, of a pale yellow colour, or with stringy mucus, occasionally frothy, and streaked with blood. The voice is not affected; speech is short and interrupted; violent pain is felt under the sternum, and the oppression is extreme. The pulse is rapid, ranging in children, as observed by M. Fauvel, from 124 to 160.

After a time, varying in different cases, the strength beginning to fail, the cough becomes less vigorous, and the expectoration more difficult. The breathing is more embarrassed, and constantly stertorous; the face and conjunctiva are highly injected; there is an expression of great terror, and the patient throws himself into singular positions to avoid lying on his back,—moving himself forward, lying on his stomach, having his head over the side of the bed, or throwing himself forward as if to meet the air which is so indispensable to him. The pulse becomes feeble, is increased in frequency, and often cannot be counted. There is constant somnolency, interrupted by momentary exacerbations, and produced by a paroxysm of coughing, the act of drinking, or by expectoration. At times delirium and agitation are observable during the night, and death soon ensues.

Acute bronchitis may likewise pass into the chronic form, or may become complicated with pneumonia; and there would seem to be no doubt, that tubercles may form, and pass through their various stages, so that death may result from phthisis. It is proper to remark, that simple bronchitis almost invariably commences in the lower and posterior portions of the lungs, usually attacking both sides, and advancing from below upwards, whilst the opposite is the case in phthisis.

The blood drawn usually exhibits, when the symptoms are at all urgent, decided indications of hyperinosis, or increase of its fibrinous element. The buffy coat is scarcely ever absent, the serum is clear, and the clot firm and consistent (*Simon*). MM. Andral and Gavarret, in six cases in which fever was present, found the maximum pro-

portion of fibrin to be 9·3, and the minimum 5·7, in 1000 parts of blood. The decreasing ratio of the corpuscles, and the increasing ratio of fibrin is less striking than in pneumonia and rheumatism. Chronic cases, unaccompanied by fever, may exhibit no augmentation of the fibrinous element. See INFLAMMATION.

Causes.—These are the same as those of the inflammatory affections of the respiratory apparatus in general. It may likewise be induced by the inhalation of irritating gases and extraneous bodies contained in the atmosphere—as in the operations of the miller, the glass-cutter, &c. &c. It forms a part, as it were, of one of the eruptive fevers—measles; and, not unfrequently, supervenes on other diseases—as variola, scarlatina, and hooping-cough.

Pathological Characters.—The bronchial mucous membrane is generally red; at times, in patches; at others, universally. Sometimes, the inflammation is confined to one lung, and even to one lobe of a lung. The redness of the mucous membrane is usually deeper in the smaller bronchial ramifications, and gradually becomes less so on ascending towards the larynx. Not uncommonly, the membrane is thickened; and when this is the case in the larger tubes, no great inconvenience may be experienced; but if it exist in the smaller tubes, so as to diminish their calibre materially, dyspnœa, with the sibilant rhonchus, may be the result. At times, the bronchial tubes are found lined with a membraniform or plastic secretion, and there is always in the bronchial subdivisions a greater or less quantity of the fluid that was expectorated during life. Often, however, it is extremely difficult, from the appearance of the bronchial mucous membrane after death, to pronounce as to the previous existence of bronchitis, even when the functional phenomena had been unequivocal. This is especially the case in children. Dilatation of the bronchia—seated at times in the larger, and at others in the smaller or capillary tubes—would seem to be the most common morbid alteration in children; which is attributed by MM. Rilliet and Barthez and by M. Fauvel to accumulation of the secretion in the tubes.

Treatment.—The treatment of a mild case of bronchitis, constituting ordinary catarrh, is extremely simple. It is generally sufficient to recommend rest in bed, the equalizing influence of the temperature proving most salutary. At the same time, the patient must abstain from animal food, and subsist chiefly on gruel or arrow-root, or tea; and, if the cough be severe, seek to allay it by means of jujube paste, simple gum lozenges, or any mucilaginous mixture or oily emulsion.

R.—Mucilag. acaciæ f℥iss.
Syrup. papav. f℥j.
Aquæ f℥iiiss.—M.
Dose, a tablespoonful, when the cough troublesome.

Or, R.—Mistur. amygdal. f℥v.
Liq. morphiæ sulphat. f℥j.—M.
Dose, a tablespoonful, when the cough is troublesome.

Before the patient goes to bed, the feet may be put into a mixture of warm salt and water, or water in which flour of mustard has been stirred, constituting the *sinapized pediluvium* of the French writers. Warm wine whey, also, acts favourably as a gentle stimulating diaphoretic; but caution is needed, where there is danger of the

supervention of acute inflammation of the bronchial tubes or of other tissues.

Where the febrile irritation is considerable, the sense of heat and pain in the chest great, with much dyspnœa, and violent and frequent cough, blood may be taken, and the operation may have to be repeated more than once or twice, when the patient is young and vigorous. In the very severe forms, indeed, the safety of the patient reposes on the vigorous employment of general bloodletting, followed by the application of cups or leeches to the chest, and, subsequently, of blisters, and the contrastimulant use of the tartrate of antimony and potassa,—on all the means, in short, which are demanded in acute laryngitis. Emetics, by their equalizing and revellent action, are especially advisable. Expectorants and diaphoretics—so much prescribed—are declared by Dr. Mackintosh, to be more injurious than beneficial, except perhaps in chronic affections; and he deplores the loss of much valuable time by trusting to their action. The remark is just. It is a great error to suppose that there is any agent, which can act either as an expectorant or as a diaphoretic in all states of the system. Where it is necessary to encourage expectoration, or diaphoresis, the pathological cause of the obstruction of the secretion must be inquired into, and, where practicable, removed; but in acute bronchitis, no expectorant or diaphoretic, which is indebted for its properties to its excitant agency, is admissible; whilst in chronic bronchitis, these agents may be employed with great advantage. In cases of *plastic bronchitis*, mercury, given so as to affect the mouth, has been regarded as a certain remedy.

It need scarcely be said, that the regimen should be that of other highly inflammatory diseases.

2. *Epidemic Acute Bronchitis.*

Synon. Influenza, I. Europæa, Catarrhus epidemicus, Febris catarrhalis epidemica, Catarrhus à contagio, Rheuma epidemicum, Epidemic catarrh.

The names given to epidemic catarrh, in various countries, and in the same country, have been various. In Germany, it has been called *Spanischer Ziep*, *Pips*, (epidemic of 1580,) *Schafhusten*, (*Sheepcough*,) *Modekrankheit*, (*fashionable disease*,) *Morbus vervecinus*, *M. Arietis*, *Hünerweh*, *Cephalalgia contagiosa*, (epidemics of the 16th and 17th centuries,) and it is now usually called *Influenz*, *Nordische Influenz*, *Russiche Katarrh*, *Blitzkatarrh*, *epidemische Schnupfenfieber*, &c. In France, it has been termed *Tac*, (*a stroke*,) *Ladendo*, *Quinte*, (used also for hooping-cough,) *Florion*, (*a violent stroke*,) *Coqueluche*, (until into the 16th century, after which it meant *hooping-cough*,) *Baraquette*, *Générale*, *Grippe*, (the common name in France at this time,) *Follette*, *Grenade*, *Coquette*, *Petite Poste*, *Petit Courier*, and *Allure*. In Italy, *Il Cortesivo Coculuco*, (until into the 16th century,) *Mal del castrone*, *Moutone*, (so called from the tone of the voice,) *Mazuchi*, and *Morbo Russo*. In Spain, *Catarrho epidemico*. In England and America, *Influenza*, (in the 18th century, *Huxham*,) and *Epidemic Catarrh*. The Italians have employed the word *Influenza* for other epidemics, and this is the reason why, in the chronology of one of their authors, Zeviani, it appears to have recurred more frequently than in that of

other historians. The following dates of the recurrence of the influenza, to the commencement of this century, are on the authority of four different chronologists. *Most.* 1712, 1729, 1732, 1743, 1762, 1782, 1800. *Saillant.* 1510, 1557, 1558, 1574, 1580, 1658, 1669, 1676, 1729, 1732, 1733, 1734, 1735, 1736, 1737, 1741, 1742, 1743, 1761, 1775, 1780. *Webster.* 1510, 1557, 1580, 1587, 1591, 1597, 1602, 1610, 1647, 1650, 1655, 1658, 1675, 1679, 1680, 1688, 1693, 1697, 1698, 1708, 1709, 1712, 1729, 1730, 1733, 1737, 1743, 1747, 1755, 1757, 1762, 1767, 1772, 1775, 1781, 1782, 1788, 1789, 1790, 1795, 1797. *Zeviani.* 1239, 1311, 1323, 1327, 1358, 1387, 1400, 1410, 1414, 1438, 1482, 1505, 1510, 1543, 1557, 1562, 1574, 1578, 1580, 1591, 1593, 1597, 1617, 1622, 1658, 1663, 1669, 1675, 1679, 1691, 1709, 1711, 1729, 1733, 1737, 1743, 1762, 1782, 1788.

A modern writer, M. Kluge, from his investigations, considers, that the following is the chronological order of the return of the true influenza. 14th century—1323, 1326. 15th century—1410, 1411, 1414. 16th century—1510, 1557, 1562, 1574, 1580, 1593. 17th century—1658, 1669, 1675, 1693. 18th century—1708, 1712, 1729, 1732, 1733, 1742, 1743, 1761, 1762, 1775, 1776. 19th century—1800, 1803, 1831, 1833;—and to these may be added the well-marked epidemics of 1837 and 1843. M. Raige Delorme, however, affirms, that there is no documentary evidence of the existence of the disease prior to the 16th century. The earliest descriptions appeared about the year 1580.

An able critic, in the *British and Foreign Medical Review*, for Oct., 1845, in noticing the lists of Most, Saillant, Webster, Zeviani, and Kluge, as given by the author, makes some corrections of Webster's list,—as where he appears to have described the same disease in different parts of its progress—giving, for instance, an influenza for each of the three successive years, 1788, 1789, and 1790; and supplies, from other sources, the epidemics of the centuries preceding the 16th, and those of the 19th century; after which he gives the following enumeration of epidemics of influenza, which he considers, if not absolutely correct, to be very nearly so. 13th century—1239. 14th century—1311, 1323, 1327, 1358, 1387, 1400. 15th century—1410, 1414, 1438, 1482. 16th century—1510, 1543, 1557, 1562, 1574, 1580, 1587, 1591, 1597. 17th century—1602, 1610, 1622, 1647, 1650, 1655, 1658, 1675, 1679, 1688, 1693, 1697. 18th century—1708, 1712, 1729, 1733, 1737, 1743, 1747, 1755, 1762, 1767, 1772, 1775, 1782, 1788, 1795, 1797. 19th century—1801, 1803, 1831, 1833, 1837, [1843.]

"We have endeavoured," the writer observes, "in compiling this list, to avoid multiplying epidemics—investing with plurality one and the same disease. But we cannot help feeling a doubt how far we have been successful in some cases. For instance, the last epidemic of the 18th century, or the first of the present one, marked by Kluge as having taken place in 1800, but which, according to our ideas, did not, at least in this country [Great Britain,] become manifest till the year next succeeding, 1801, we find in Kluge's list followed by one in 1803. Now we cannot help feeling a doubt whether these two, inserted as distinct, were not the same disease continued in various parts of the

world. A similar remark applies to the epidemics noted for 1831 and 1833. That of 1833 was manifest enough—in fact, was little inferior in intensity and diffusion to the great influenza of 1837; whilst in certain districts of England there was no epidemic in 1831. Having repeatedly, however, observed, that epidemics grow up slowly in communities, their seeds scattered here and there, requiring time for their perfect development and outbreak, we think it probable that an epidemic had been existing somewhere, in a slight degree, in 1831, which did not reach its height of diffusion and intensity till 1833. Making every allowance, however, for confusion from this source, we have, during a period of five centuries and a half, epidemics of influenza at the rate of eight and a half per century."

The most remarkable, perhaps, of the influenzas, was that of 1782, although those of the last ten years were sufficiently striking in their general phenomena and peculiarities. The one of 1782 began in Europe in the far north, and in December, 1781, reached St. Petersburg, where it attacked, with electrical rapidity, 40,000 people in a single day, whence it got from the French the name of *La Russe*, and from other nations the appellation *Russian*. From St. Petersburg it spread to Poland, Denmark, and Germany, in June and July of 1784, had reached France, Spain, England, and Scotland; and in September of the same year was rife in the British American colonies. In the epidemic of 1831, according to Most, 30,000 people, it was asserted, were suffering at the same time in Berlin; and, at a later period, 45,000 in Paris. Of the European epidemics of 1831, 1833, and 1837, the two first were less severe, and attacked fewer individuals than the last.

From a general view of various influenzas, M. Andral has deduced, that:—*First.* They differ as to the extent of their sphere of action—some appearing only in certain countries, whilst others invade the whole earth. *Secondly.* Almost all have travelled rapidly, commencing in the north, and extending towards the south,—at times, like a vast torrent, spreading from neighbourhood to neighbourhood; at others, bounding from countries to countries, sparing whole regions to rage in others more distant. *Thirdly.* As regards the number attacked;—at times, but few have been affected at first; at others, numbers. *Fourthly.* In regard to severity;—some have been devoid of danger, whilst others have been fatal, and have destroyed children and old persons especially. *Fifthly.* As regards symptoms,—each epidemic has presented some special phenomenon; every form has constituted, as it were, a a sort of morbid individuality, which, after its manner, ran through phases of increase and decrease, always commencing in the same way, and being invariably like unto itself. *Sixthly.* As to the parts affected; some have been limited to the bronchia, but most commonly the disease invaded other mucous membranes, when the reaction was generally violent, and the affection assumed the inflammatory form; in one case, the morbid condition of the nervous system predominated, and its influence was exhibited by an ataxic or adynamic form of the disease; in other cases, it was accompanied by hæmoptysis or by an exhalation of blood from other mucous membranes; at times, much sweating at-

tended it; and, occasionally, the fluid of perspiration was extremely fetid. Lastly,—in certain cases, an effusion of serous fluid occurred into the abdomen.

It has been remarked by Dr. Geo. Gregory, that severe as the disease is, it is not one of danger, the bills of mortality seldom indicating any notable increase in the proportion of deaths during the existence of such an epidemic. This, however, can only apply to certain epidemics: others have proved extremely fatal. The mortality of the epidemic of 1837, in Europe, was greater than that from cholera, although the disease was by no means so severe, or so rapidly fatal. This was owing to its attacking almost every person in society, whilst the ravages of cholera were comparatively limited. It has been estimated, by Dr. Graves, that in Dublin alone, 4,000 persons died of the influenza of 1837. From the returns of a single cemetery—the Prospect Cemetery, Glasnevin, probably the largest in Ireland—the increase of burials, during months in which the influenza prevailed, was 747.

In December, 1835,	355	In December, 1836,	413
January, 1836,	392	January, 1837,	821
February, 1836,	362	February, 1837,	537
March, 1836,	392	March, 1837,	477
Total for four months	1501		2248

Increase, during influenza, 747.

In Hamburg, according to Assing, there died in January, 1836, 466 persons; in December, 1836, 364 persons; and in January, 1837, whilst the influenza was raging, 836 persons. The mortality was extremely great among the aged.

Ages.	Jan. 1836.	Dec. 1836.	Jan. 1837.
Between 20 and 30	35	28	48
30 " 40	35	45	68
40 " 50	36	29	58
50 " 60	36	38	90
60 " 70	55	36	128
70 " 80	37	36	117
80 " 90	12	10	37
90 " 100	4	2	3
102	-	-	1
Diseases.			
Apoplexy,	33	41	67
Inflammation of lungs and pleura,	24	8	165
Catarrhus suffocativus,	11	9	38
Phthisis pulmonalis,	64	57	151
Marasmus senilis,	48	44	101

If we were to judge from the census of Ireland for 1841, it would seem to destroy many more males than females:—the ratio of the former to the latter in the ten years being as 100 to 84·65.

Causes.—As to the causes of influenza, we know no more than we do of those of other epidemic diseases. It has appeared in all countries, and has raged with equal severity in all seasons, and, so far as can be observed, in all conditions of the atmosphere. Hence it has been conceived that it may depend chiefly on telluric influence, or upon some agency connected with variations in the physical conditions which operate on the external surface of the earth: but the supposition

only indicates the little knowledge we have of the subject. The influenza of 1833–4 was by no means so generally fatal as that of 1837. Both were characterized by considerable irritation of the lining membrane of the air-passages, but that of 1837 was attended by severe bronchitis and pneumonia, which were not as frequently seen in the epidemic of 1833–4: the accompanying fever of the latter was likewise more acute.

In regard to the nature of the disease, various opinions have been entertained. Essentially, it consists of the catenation of symptoms, to which the term catarrh or bronchitis is appropriated; but along with this, especially in the epidemic of 1837, the nervous system was greatly implicated. By one of the writers on that epidemic, Dr. Blakiston, it has been designated "an affection of the nervous system, with its concomitant derangement in the organs of digestion, circulation, &c., commonly known under the name 'nervous fever,' accompanied *throughout its whole course* by irritation of the pulmonary mucous membrane;" and this view appears to have been embraced essentially by other writers on the subject. Andral, however, concludes that it is a general affection, the nature and cause of which are as unknown as those of the greater part of epidemics, which appear at irregular epochs.

Treatment.—If such be the diversity of phenomena in influenza, and such the uncertainty that hangs over it, it need scarcely be said that no fixed rule of treatment can be laid down. In simple, uncomplicated cases, very little management has been required. Keeping the patient in bed, and treating him as if affected with ordinary catarrh, has usually proved sufficient. By some, bloodletting was always considered to be counter-indicated, and especially if it were not employed within the first twelve or twenty-four hours; but when used very early, it often proved efficacious. Where any doubt, however, exists, ten or twenty leeches may be applied over the sternum, or from five to ten ounces of blood be taken by cupping.

When the mouth is clammy or bitter, and the tongue coated, with inappetency for food, and a sense of weight at the epigastrium, an emetic may be given with advantage.

R.—Ipecac. pulv. gr. xv.—xx.—or
Antim. et. potass. tart. gr. ij.

The tartrate of antimony and potassa has also been administered as a nauseant, and in large doses as a contra-stimulant, but it has not exhibited the efficacy which it exerts in high inflammatory diseases—as pneumonia and pleurisy, in which, when conjoined with the lancet, it has been regarded by Dr. Cartwright, of Natchez, as almost a specific. [?] The lobelia inflata has been suggested by the same gentleman in influenza, under the notion that "in those diseases affecting the mucous lining of the bronchial tubes, the lobelia inflata comes as near being a specific as tartar emetic and the lancet in pneumonia and pleurisy." The lobelia is certainly a valuable sedative, but not deserving of the elevated rank that has been assigned to it. The diseases of the bronchial tubes differ, and no one remedy can be applicable to every pathological condition. When there was more than usual in-

flammation of the bronchia, in the epidemic of 1837, large doses of the ethereal tincture of lobelia, repeated at short intervals, with counter-irritation, "seemed," according to Dr. Blakiston, to be useful.

Dr. Peebles, of Petersburg, Virginia, strongly recommends eupatorium perfoliatum. The patient, after being covered in bed, is made to swallow a wineglassful of the warm infusion, prepared by infusing an ounce of the dried leaves in a pint of boiling water. After the fourth or fifth dose, considerable nausea, with sometimes vomiting and free diaphoresis, and expectoration has generally ensued, after which the infusion was given only every third or fourth hour, in the same dose, to keep up the impression on the system.

Should the cough be dry, and harassing, opiates may be administered, with mucilages or emulsions.

℞.—Emuls. amygd. f℥vj.
Liq. morphiæ sulphat. f℥ij.—M.
Dose, a tablespoonful occasionally.

Or, ℞.—Mucilag. acaciæ f℥j.
Syrup. tolut. f℥iij.
Ol. oliv. f℥ss.
Aquæ f℥ivss.—M.
Dose, the same as the last.

As to the particular form of counter-irritation, some difference of sentiment has existed. In the epidemic of 1837, blisters were not found as serviceable in all cases, as had been anticipated:—fomenting the neck and chest with very hot water according to Dr. Graves appeared to be much more serviceable. At the commencement of the attack, it was often found necessary to have recourse to diffusible excitants, and to administer tonics at an early stage; and, during convalescence, it was generally requisite to prescribe tonics, to restore the languishing functions of the stomach.

b. *Chronic Bronchitis.*

Synon. — Tussis senilis, Catarrhus senilis, Rheuma catarrhale, Peripneumonia notha' Bronchorrhœa acuta, Bronchocace, Winter cough, Chronic catarrh.

Chronic bronchitis is one of the most common diseases of the temperate regions of the globe; yet—strange to say—it is only within the present century, that its pathology has been clearly understood. Neither acute nor chronic bronchitis was comprehended in its true relations, until in 1808 an interesting treatise on bronchitis first appeared by Dr. Badham; which was followed, not long after, by another on the chronic forms of the disease, by Dr. Hastings. Since then, the inflammatory affections of the lining membrane of the bronchial tubes have received great attention from pathologists.

Diagnosis.—It may be proper to observe, before detailing the symptoms, that the trachea itself may be affected with chronic inflammation—constituting *chronic tracheitis*—independently of any affection of the laryngeal and bronchial mucous membrane: commonly, however, the inflammation extends, so that either the larynx or the bronchia become implicated.

When the trachea is affected alone, the disease is denoted by cough, —slight perhaps at first, but subsequently violent, with mucous expectoration, streaked at times with blood, and occasionally purulent. The pain is sometimes severe, and is felt from the base of the cricoid

cartilage to behind the last portion of the sternum. When the mucous membrane is ulcerated, and greatly tumefied, a whistling sound is heard during respiration, which may give rise to the idea, that there is a tumour within the trachea. This state of the mucous membrane is accompanied by dyspnœa. The voice is rough, but not extinguished or veiled, unless the inflammation implicates the inferior ligaments of the larynx. The general symptoms are the same as in chronic laryngitis; and, as in the latter we have phthisis laryngea, so, in the former, we may have phthisis trachealis.

Chronic bronchitis may be the termination of the acute; but, in other cases, it exists where there have been no evidences of the latter. The symptoms vary very materially, but in every case there is cough, differing, however, in its character and intensity, but always more marked, perhaps, than in other diseases of the respiratory organs. The expectoration, too, differs greatly. At times, it is clear and transparent; at others, very frothy; or, on the other hand, viscid, adhesive, and containing small white grains which adhere to the vessel. These particles have been mistaken for portions of pulmonary tubercle, and, therefore, have been supposed to be indicative of phthisis; but if there be any doubt as to their nature and origin, the doubt may be removed by placing some of them on a piece of paper, and exposing them to heat. If they be merely sebaceous matter from the mucous follicles of the fauces and pharynx, they will leave on the paper a greasy stain, which will not be the case, provided they are tubercular matter from the lungs. In other cases, the sputa consist of a greenish-yellow puriform mucus, which may either form a homogeneous mass, or the matter of each expectoration may remain distinct. Commonly, they are devoid of smell, but at times, they are insupportably fetid. Cases of this kind have fallen under the author's care, which have ultimately recovered; and many such are on record, on the authority of Messrs. Bricheteau, Stokes, Cook, (of Buskirk's Bridge, New York,) and others. The quantity of the expectorated matter varies, likewise, materially. At times, it is so great as to exhaust; in other cases, the cough is severe and fatiguing, whilst the expectoration may be so trifling, that the disease has been called *dry catarrh* or *dry bronchitis*,—*catarrhe sec*, of the French writers. The respiration may not be much affected; but, commonly, it is more or less oppressed, and, at times, seems to be complicated, as it were, with asthma—the difficulty of breathing recurring in paroxysms. Commonly, there is not much pain attendant upon it, unless the paroxysms of coughing are frequent, and severe. Nor are the general symptoms usually marked. At times, there is no accompanying fever; but, in other cases, the febrile movement is considerable; the inflammatory affection passing to the subacute form. When this is the case, the nutrition of the system is affected; emaciation takes place, with evident febrile exacerbations towards evening, and all the signs of hectic, under which the individual is gradually worn away.

These are the severe forms of the affection, which approximate, in their symptoms, to phthisis pulmonalis. In milder cases, individuals may be affected for years with chronic cough and expectoration,

without the general health suffering materially, if at all. Generally, the disease disappears, or is decidedly improved during the summer, —returning every winter, so as to give occasion to the name *winter cough.*

It has been already remarked, that the patient may die, worn out by hectic fever: it would seem, likewise, that death may occur, in old people especially, owing to the copious secretion of mucus into the small bronchial ramifications interfering with hæmatosis, so that the nutrition of the frame is, in this way, modified, and asthenia induced,—giving rise to the *Bronchitis asthenica* of authors, or to simple gleet or *Bronchorrhœa;* Fr. *Bronchorrhée, Catarrhe pituiteux, Phlegmorrhagie pulmonaire, Flux bronchique;* under which—especially on the supervention of inflammatory or other irritation in some other part of the economy—the patient succumbs.

Occasionally, chronic bronchitis is accompanied by some affection of the lungs or pleura, or some chronic cardiac affection, which must be appreciated, in order to form a sound prognosis, and to establish proper indications of therapeutics.

The physical signs, like those of the acute form, are purely negative. The resonance of the chest may exist throughout. The different rhonchi or *râles* are heard as in acute bronchitis;—for example, the mucous *râle,* which never occupies the whole extent of the chest, is not constant, and scarcely ever masks the vesicular murmur; sibilant *râles* of different character, which have been compared in certain cases to the clacking of a small valve, or to the pronunciation of the word *tic;* gurglings, like those of phthisis, heard in parts where dilatations of the bronchial tubes exist; and cavernous respiration, pectoriloquy, or diffuse bronchophony with humid *râle,* where the bronchial dilatations are considerable, and implicate a great number of the bronchia.

The diagnosis is generally easy; but, at times, marked difficulties exist. Thus, incipient phthisis, when it has not induced much engorgement of the lung, and when the tubercles are not present in sufficient number to yield a dull sound, may be taken for simple chronic bronchitis; and, again, when the latter is accompanied by dilatation of the bronchia it may present some of the least equivocal physical signs of phthisis. By careful observation, however, the error may most commonly be avoided. Without taking into consideration the general symptoms, the mucous rhonchi or *râles* will be found to occupy different situations in the two diseases. The modification of the respiratory murmur, which precedes the establishment of those *râles,* is heard at the summit of the lung in phthisis; the physical signs are constant over the same part; whilst, in chronic bronchitis, the *râles* are heard generally over the lungs, and vary in their character at different periods.

As regards the dilatation of the bronchia, which may give rise to obscurity in the diagnosis, it is rarely accompanied by induration of the lung sufficiently great to occasion any marked diminution of the sound on percussion, as is the case in phthisis around the tubercular excavations. The dilatation, moreover, does not always exist at the apices of the lungs; more commonly, it occupies the middle portion,

and it continues for a long time without inducing any rapid and constantly augmenting effects.

Causes.—Chronic bronchitis is often a sequel of the acute form; but, as has been seen, it occurs as a primary disease. It is very common in advanced life, and especially in those whose constitutions have been injured by excesses. At times, it is observed in children, especially after hooping-cough. It is not common, however, in childhood; more frequently occurring above the age of fifty. In certain regions, too, it would appear to be connected somewhat with the locality, as in cold, damp situations, on the coasts of seas and lakes; but the rule is by no means general. M. Wunderlich thinks it probable, that there may be a sort of antagonism between chronic catarrh and tuberculosis, as in Tübingen at least, tuberculosis is comparatively rare, whilst chronic catarrh is very general amongst the aged. Occasionally, however, it is associated with tubercles of the lungs, or with some organic disease of the heart. Like acute bronchitis, it may be also occasioned by irritating substances floating about in the atmosphere. It is said by Laënnec to have succeeded to the repercussion of acute or chronic cutaneous eruptions, and the suppression of some habitual flux or hemorrhage.

MM. Andral and Gavarret analysed the blood in chronic bronchitis. They affirm, that as the febrile symptoms disappear, and the bronchitis becomes chronic, the blood ceases to exhibit a large excess of fibrin, and does not in fact differ in any respect from ordinary blood.

Pathological Characters.—The mucous membrane, which is of a vivid red colour in acute bronchitis, is of various shades of red in the chronic form. When the inflammatory stage has wholly passed away, and the discharge has become a true gleet of the bronchial mucous membrane or a *bronchorrhœa*, the membrane may be found very pale, or of a yellowish hue.

The bronchial ramifications contain mucus and other secretions, similar to those expectorated; and, at times, there is a true fibrinous secretion, which clogs up the tubes, and extends, like the branches of a tree, into their various subdivisions. This plastic bronchitis is often associated with the presence of tubercles and tubercular cavities in the lungs. In a case, which recently fell under the author's care, the quantity of membraniform arborizations expectorated was very great; and both the general and the physical signs indicated the coexistence of bronchitis and phthisis. On dissection, many of the bronchial tubes of the right lung were found to contain the fibrinous secretion, and others were dilated; whilst, in both lungs, tubercles were found both quiescent and in a state of softening, or already softened. The nutrition of the mucous membrane itself is generally more or less affected. It may be indurated, or softened, or, here and there, ulcerated; and this is most frequently the case in the *Asthma pulverulentum*, *A. gypseum*, *A. montanum* or *Staubasthma* of the Germans, which is produced by pulverulent particles passing in with the air of inspiration, and exciting inflammation and its consequences in the bronchial tubes. According to MM. Louis and Andral, however, ulcerations of the tubes are exceedingly rare where there is no tubercular disease. The mucous

membrane is more frequently thickened, occasionally to such an extent as to obliterate the smaller bronchial ramifications, and to diminish the calibre of those of larger size.

One of the most interesting of the lesions is the dilatation of one or more of the bronchial tubes—*Bronchiectasis, Dilatatio bronchiorum.* Sometimes, this is uniform; at others, it is a sudden dilatation, forming a considerable cavity in one of the tubes; and, at others, again, a bronchium is observed to present several successive strictures and dilatations. The solitary dilatations vary in size, sometimes being no larger than a hempseed; at others, able to contain an almond or a walnut.

Under the name *Cirrhosis of the Lung*, Dr. Corrigan has described a pathological condition, the general character of which is a tendency to consolidation or contraction of the pulmonary cellular tissue with dilatation of the bronchial tubes. The diminution of the lung is regarded by him as the first step in the disease, and the dilatation of the bronchia the consequence of this. At a meeting of the Pathological Society of Dublin, Dr. Greene exhibited a specimen of pulmonary cirrhosis with dilated bronchial tubes, closely resembling phthisical cavities, taken from a woman who had suffered for a long time from intractable cough and a train of phenomena strongly resembling phthisis. The physical signs were—cavernous respiration and distinct pectoriloquy in the right infraclavicular space: the latter sign was also found at the inferior angle of the scapula, and in the right axilla: distinct gurgling, with bronchial respiration, could be heard in various parts of the chest. The left lung presented the signs of bronchitis. On examination after death, the lung was found diminished in size, and indurated: the cavities formed by the dilatation of the tubes were of considerable size, and did not contain purulent matter: they were largest near the surface of the lung, and towards its upper part their cartilaginous structure could be distinctly traced. There was no sign of tuberculosis in either lung.

The author, at the time of writing this, had under his care a female, who presented all the phenomena which lead to the belief of a morbid condition of the kind. When he first saw her, about three years before, she was considered to be labouring under phthisis; yet no change had occurred since that time, during the whole of which she had been under his observation. The sounds on inspiration and expiration were of the most anomalous character, comprising all the varieties of sonorous and sibilant rhonchi: the respiration was almost wholly tubal in both lungs: the chest appeared to be somewhat enlarged, and was highly resonant on percussion; so that along with the pulmonary condensation there was probably also emphysema. All these functional phenomena were subject to occasional exacerbations. She had no hectic; and, although the appearance of the sputa was often equivocal, it had never been decidedly purulent.

Treatment.—This must be regulated by circumstances. When there is much febrile and inflammatory excitement, the disease must be treated as a case of acute bronchitis, no matter how long it may have persisted; but when the active inflammatory symptoms have passed

away, an opposite course may be demanded, and one which combines a gently excitant with a revellent agency; watching carefully, however, and having recourse to antiphlogistics, whenever there is any appearance of fresh inflammation, or of a renewal of the old. Perhaps the best of all remedies, employed in chronic bronchitis, belong to the class of revellents. Intermittent counter-irritation, effected by successive blisters, or by the application of the tartarized antimony ointment, or by croton oil, proves extremely serviceable; and it is by the new action induced on the surface, that flannel, worn next the skin, is so salutary a remedy in such cases. With the same view, a large portion of the chest may be sponged daily with a liniment, composed of spirit of turpentine and acetic acid, so as to keep up an erythematous state of the surface.[a] This is recommended as an easily manageable and efficacious remedy; and it is affirmed by Dr. Graves, to be an imitation of the celebrated liniment of St. John Long, the famous empiric.

[a] R.—Ol. terebinth. f ℥iij.
Acid. acetic. fort. f ℥ss.
Vitell. ovi,
Aquæ rosæ f ℥iiss.
Ol. limon. f ℥j.—M.

The beneficial agency of emetics, is, perhaps, chiefly revellent. Almost all therapeutists depose to their value, not only in aiding mechanically the expulsion of the secretion from the tubes, but interfering with its too copious reproduction. The ordinary emetics of ipecacuanha and tartarized antimony, or of both combined, are the most advisable, owing to the powerful revulsion effected by them through the state of nausea, and the subsequent emesis. The bronchial tubes being cleared, in this manner, of the great quantity of mucus, hæmatosis is more readily accomplished, and if lividity of the countenance have previously existed, it disappears. They have been esteemed most serviceable at night, taken immediately before the hour of rest, and in the morning, especially after a tolerably long sleep, when time has been afforded for an accumulation of secretion in the bronchial tubes.

It is in these cases of bronchorrhœa, that the various substances belonging to the class of reputed expectorants have been administered largely, although it is not always easy to understand the precise object which the prescriber has had in view. In asthenic forms of bronchitis, the expectoration is generally too copious, and the powers too slight to expel it with facility; a remedy, consequently, which is possessed of gently excitant properties, by arousing those powers, may favour expectoration; but there is no reason for believing that we are possessed of a medicinal substance, which has the faculty of promoting the expulsion of fluid from the lungs by any specific action, which it is capable of exerting on the parts concerned. (The author's *General Therapeutics and Mat. Med.* 3d edit. i. 219, Philad. 1846.) The expectorants, commonly advised, are squill, ammoniacum, myrrh, polygala senega, &c., alone, or in combination; but although the author has prescribed them frequently, and carefully watched their effects, he has never been able to observe any result, except what might be

ascribed to their excitant impression on the stomach, and its extension to other parts of the system. Every one, affected with ordinary catarrh, in which the secretion of mucus has been considerable, must have observed the comparative facility with which he has expectorated, even after an ordinary meal, through the impression it has made primarily on the stomach. "Expectorants," says Dr. Mackintosh, "*appear to be somewhat serviceable*, and the best is squills. But I have seen expectorants used for a considerable time without any benefit, till after the application of a blister, or the use of the inhaler, when the discharge has become free and easy." Dr. Mackintosh's opinion of the virtues of expectorants does not seem to exceed that of the author. Where the cough, however, is severe, and the bronchial irritation great, relief may be obtained by any of the ordinary saccharine, mucilaginous or oily mixtures, with or without the addition of anodynes, which produce their beneficial effects in the mode elsewhere explained.

Among the various excitant substances, prescribed in chronic bronchitis, the balsams have been ranked highly. Their efficacy in diseases of the mucous membrane of the intestinal canal led to the belief, that they might be serviceable in affections of the pulmonary mucous membrane likewise; and, accordingly, they have been much employed, especially copaiba, and the terebinthinate preparations; but the testimony in their favour has not been uniform. The author's experience is not more favourable than that of some others; and when benefit has resulted from their employment, it has seemed to be owing to the excitant effects of the remedies, rather than to any special action, which they exerted on the pulmonary mucous membrane.

It is in cases of chronic bronchitis, that naphtha or pyro-acetic spirit, introduced into notice a few years ago as an agent for the cure of consumption, and since employed largely in the most empirical manner, may be productive of advantage. It may be classed with creasote and the balsams, amongst excitant expectorants. Its dose is from ten to twenty drops three times a day, in a small quantity of water. After the second or third day, the dose may be augmented—the quantity being increased or diminished according to the absence or presence of nausea, vomiting or any other untoward symptom occasioned by it. (The author's *New Remedies*, 5th edit. p. 558, Philad. 1846.)

In many cases of chronic bronchitis, the patient is doomed to suffer during the whole winter, and to improve on the approach of summer; time is, therefore, an important element in any improvement that may take place, and many agents doubtless frequently rob it of the credit to which it is entitled.

By a similar kind of reasoning to that employed in the case of copaiba, strychnia has been suggested in chronic bronchitis. From its efficacy in analogous affections of the digestive mucous membrane, good reason, it was conceived, existed for the hope, that it would prove effective here. The author has never employed it, nor is he aware of any successful results from its administration.

In Germany, the tops of *galeopsis grandiflora*, a plant which is ranked there as a "bitter resolvent," and which is supposed to be the

basis of a nostrum celebrated in pectoral diseases under the name of "Blankenheimer tea," (*Blankenheimer Thee*,) or "Lieber's pectoral and phthisical herbs," (*Liebersche Brust* oder *Auszehrungskrauter*,) have enjoyed great repute.

℞.—Summitat. galeops. grandiflor.
Althææ rad. ää ℥j.
Glycyrrhiz. ℥ij.—M.
A fourth part of this to be boiled in a pint and a half of water, and to be taken daily.

Tar-water was at one time highly extolled in pulmonary affections, and amongst the rest in pulmonary catarrh and chronic bronchitis, and since the discovery of creasote, which is its main active ingredient, fresh trials have been instituted with it. The author has administered it freely, and in cases in which the ordinary excitant expectorants are found to be serviceable it has afforded relief; but farther than this no advantage has appeared to accrue from its administration. It is easily prepared.

℞.—Picis liquid. ℥j.
Digere in aquæ Oij. per dies octo et cola.
Dose, from f℥viij. to f℥xij. in the day, mixed with milk.

Creasote itself has been administered in the same cases;[a] but it does not appear to possess more virtues than the tar-water.

[a] ℞.—Creasot. gtt. v.
Mucilag. acaciæ f℥iij.
Syrup. tolut. f℥j.—M.
Dose, a tablespoonful every four hours.

The acetate of lead has been brought forward as the remedy by far most worthy of reliance in bronchitis attended with profuse secretion. Its administration was limited to the period of the disease, in which the evidences of abundant secretion were apparent. The dose for children was gr. $\frac{1}{4}$, gr. ss. to gr. j. eight or ten times a day; and from one to three grains for the adult, so as not to exceed 12 grains in the day. Messrs. Ballard and Garrod are of opinion, that the expectoration may be materially "influenced" by gallic acid, which may be given in the dose of a grain or two, three times a day, in the form of pill.

The most valuable mode of exhibiting many agents, so as to act effectively on the mucous membrane, is by inhalation. Where the secretion is readily accomplished, and the affection belongs to the form of catarrh denominated *dry*, the inhalations may be of the steam of water; on the other hand, should it be advisable to stimulate the mucous membrane, the vapour from the infusion of chamomile flowers, or of some other excitant, whose properties are dependent upon volatile oil, may be inhaled. Tar-vapour, which was at one time so highly extolled in phthisis, appears rather adapted for the disease under consideration, and many of the cases of reputed phthisis, recorded in the books as cured by it, were doubtless chronic bronchitis. The inhalation of chlorine has been serviceable in like cases. It may be inhaled from a common dish, or inhaling vessel, or from a well-contrived apparatus proposed by Dr. Corrigan, of Dublin, (see the author's *New Remedies*, 5th edit. p. 166, Philad. 1846,) by dropping any of the acids

on a mixture of chlorinated lime, so that the acid may be disengaged slowly; and, in like manner, creasote may be inhaled; five, ten, or fifteen drops, according to the degree of tolerance of the lungs, being dropped into hot water, and the vapour received into them. Iodine has been administered in the same way; at times, alone; at others, associated with conium, in the manner advised in phthisis; but whilst some extol it highly, others have not been able to observe the least benefit from it.

Conium itself and other narcotics have been used in the same manner, twelve or fifteen grains of the extract being diffused in an inhaling apparatus, and the vapour drawn into the lungs for a quarter of an hour, once or twice a day. There are many cases, in which the internal administration of narcotics, acronarcotics, and sedatives, must be serviceable. If the cough be troublesome, the various preparations of opium, hyoscyamus, hemlock, or belladonna, may be given with much advantage. Colchicum[a] has been commended by many, and by others, the hydrocyanic acid.[b]

[a] R.—Tinct. colchic. f℥ss.
Sp. æther. nitric. f℥j.—M.
Dose, twenty drops, three times a day on sugar.

[b] R.—Acid. hydrocyanic. gtt. xv.
Mucilag. acac.
Syrupi ää f℥ss.
Aquæ f℥v.—M.
Dose, a tablespoonful five or six times a day.

Where persons are liable to attacks of chronic bronchitis, it becomes important that they should be avoided by a change of air, especially from a cold and moist climate to one that is warm and dry. The West India islands, particularly Santa Cruz, offer the best situations for this purpose, all the American and European climates being proverbially liable to great vicissitudes. In cases of phthisis, as will be shown, these vicissitudes, provided they are only within certain limits, are not to be deprecated; but to those who are predisposed to chronic bronchitis they are injurious. Still, a mere change of air to countries which are themselves exposed to cold and disagreeable winds—for example, to southern France and Italy—is often decidedly serviceable under the new impressions excited; and there are places in the Mediterranean, such as Hières, which are well sheltered, and, therefore, not liable to the objections that may be brought against some of the other localities frequented by invalids. In the United States, Pensacola offers perhaps as many advantages as any other southern situation; possessing, as it does, a comparatively genial climate, and accommodations—the presence or absence of which must always be taken into consideration—for the valetudinarian. In this way, the winter may be escaped, and the habit be occasionally broken in upon. There are but few invalids, who are subject to bronchitis, who can bear with impunity the contact of very cold air with the pulmonary mucous membrane: hence, they are compelled to breathe through folds of gauze, or to hold a handkerchief to the mouth, whenever they are exposed to it. An instrument has been invented, called a *Respirator*, which consists of several strata of fine wire, through which the air can pass with facility, and, in its passage, have its temperature modified, so that no

irritation is produced in the lungs. It is an ingenious and successful invention, but is somewhat expensive, and not much used.

The bronchitic individual should be careful to protect himself against irregular exposure, by casing himself in flannel. He should be especially careful not to expose himself to the night air, or to go abroad in cold damp weather, particularly during the prevalence of one of our northeast winds. By these precautions, with the use of the flesh-brush, and ordinary attention in other respects, the disease may be warded off; but should they fail, change of climate becomes essential.

a. *Summer Bronchitis.*

Synon. Summer catarrh, Catarrhus æstivus, Hay-asthma, Hay-fever, Rose catarrh; *Ger.* Sommerkatarrh, Heufieber, Heuasthma.

A singular variety of chronic bronchitis is met with in the summer and autumnal seasons, both in this country and in Europe, which has received various names, indicative of the period of the year at which it occurs, or of the causes which are supposed to give rise to it. It has been well described of late years only, and chiefly by British writers.

Diagnosis.—The most constant symptoms are itching of the eyelids, and, at times, of the inner canthi of the eyes, with irregular attacks of violent sneezing, sense of weight on inspiration, and, at times, considerable dyspnœa, copious discharges from the Schneiderian membrane, redness of the conjunctiva and sense of weight in the forehead, with suspension—partial or entire—of smell and taste, during the continuance of the disease. The exacerbations have commonly been observed to supervene in the morning, a short time after rising; but frequently they appear several times in the course of the day.

The following letters from intelligent individuals, themselves sufferers under the malady, will best exhibit its course and character. The first is from a practitioner of Bristol, England, to Dr. Elliotson. "I knew nothing," he remarks, "about hay-fever as any definite disease; but your description of it is, with little exception, a very accurate description of what I suffered, every June, for several years. Were I not, at the present time, annoyed by this troublesome affection, I should probably not have found leisure to give you the trouble of reading anything on this subject. The attack generally begins, with me, at the latter end of May, with great itching of the eyelids, particularly at the inner canthi, from which I regularly, during this month, extract some cilia, which grow very near the cornea, and increase the irritation. My most troublesome symptom is sneezing. It is of a violent kind, and often continues eight or ten times. The defluxion from the nostrils is most copious at these periods of the day, while, in the intervals, I have no catarrhal symptoms. Expectoration of clear mucus is also considerable. My sneezing attacks are sure to come on while I am visiting my patients, to my great annoyance. This comfortless state generally continues five or six weeks, but is never sufficient to interrupt any of my employments, or render any confinement *necessary*, though I am always free from it when in the house. How far grass or hay has anything to do with this affection, I cannot satisfactorily determine.

There certainly are several hay-fields within a quarter of a mile of my house. The *air* seems to make me worse, and an open window is my abhorrence, while I am thus indisposed. Last week I spent an hour or two in a friend's hay-field, with a party of ladies, but the syllabub, the ladies, and the pastoral sports, had no amusement for me; and I was glad to get to a corner of the park, where my streaming eyes and nostrils, and noisy sternutations might escape both remark and commiseration. Certainly, during that afternoon, in the hay-field, was the worst attack I have had; but whether it was the *air*, which was cooler than usual, or the *hay*, I could not tell. I must however confess that my *fancy* on the subject has always leaned more to the effect of some subtile particles of an irritating nature, than to the ordinary causes of catarrhal affections. My lungs are rather asthmatic; formerly I had a good deal of asthma. I have never found time *to try* any remedies."

The subjoined letter is from a patient of the author, who has been long a sufferer under this disagreeable affection, and who kindly furnished the particulars of his case, but whose modesty shrinks from the publicity of having his name attached to it. Had it pleased him so to do, it would have been found to be that of a gentleman whose intelligence and sterling worth are known and appreciated far from the locality in which he resides.

Baltimore, June 30th, 1840.

"My dear Sir,

"I will very cheerfully endeavour to give you, in terms as few, and at the same time as full, as circumstances allow, my recollections of the catarrh with which I am periodically visited, establishing one only condition most explicitly, that *my name* is in no wise to be referred to. Of this I should have great horror. My impression is, that the first attack was late in the summer of 1823, which followed the summer (1822) in which I had undergone an operation for the removal of hemorrhoidal tumours. These I had suffered from since my boyhood, and they were wont to *bleed freely*. I had made a voyage during the same season. The operation arrested the discharge. The attack, which has generally occurred after the middle of July, (but not always *on the same day of the month*, as was the case with Mr. ——, Mr. ——, Dr. ——, I believe, and others,) was always sudden, and without any apparent predisposing cause. It is sensibly aggravated by fruits generally, and by peaches in particular, and it never was as bad, or lasting, as during the season in which I resolved to persevere in a cooling diet, eating fruit freely—for which there is an inordinate demand—and drinking ice water. It is accompanied by two or three paroxysms in a day of violent sneezing, and most copious flow, from the nostrils, of a limpid secretion like tears; and, with *me*, the sympathy between the eyes and throat does not appear until some weeks, and is not violent. The affection is mainly of the head. I can arrest it by inhaling laudanum through the nostrils, but suffer much from the experiment, and am glad, by means of snuff, to bring it on again. It gradually wears out,—in general in the course of October,—and in the latter stages the secretion assumes

the appearance of the effects of a common cold. It leaves me liable to chills in the night, which awake me from a sound sleep, and it also leaves a liability to a nervous sensation, which creeps over me like an approaching faintness. This is apt to come on almost at the moment after taking coffee in the morning, and at other times. I have tried countless remedies, *regular* and *irregular*, and nothing cures: some things aggravate; few mitigate. The prussic acid with black drop, three times a day in small doses, has generally been useful. Rowand's tonic mixture is a good preparation, and, I think, palliates the symptoms in their course. Fatigue, exposure, excitement, all aggravate. Moderation, quiet, *comfortable diet*, the sofa, not the bed, riding rather than walking, suit me in the season. The effect on the nerves is terrible, but on the constitution eventually slight. I am convinced it *ought not to be cured*, and Dr. Physick of Philadelphia told me, that he had utterly failed in the several cases that had come under his care. I have been told more than once that it is gouty, and there was gout in my family. It has been commencing earlier for some few years than formerly, but is not continual until the stated season, and then the *dripping* from the nostrils is *almost ceaseless*. Tepid bathing, I think, aggravates the symptoms. When badly managed, it has lingered on, with intermissions, until mid-winter. It is a mighty trial of faith, patience, and good nature, &c.; and if I were on a jury before whom one was tried for murder, who could prove that at the alleged season he was afflicted with this catarrh, I should suspect him the more grievously, but deal with him much more leniently.

"Among the symptoms I failed to remark, that it causes a writer to be very clumsy and confused. From this, and the history, which you have above, you will immediately infer the fact, that I am suffering from it already. Add to this the hour—12 P. M.—and you will not be surprised at the style of the drawing."

It is obvious from these ample details, that the disease does not belong to asthma—as we now define it—that is, to nervous or spasmodic asthma, but that it consists essentially of inflammatory irritation of the mucous membrane of the eyes, nose, and the whole of the respiratory apparatus,—the dyspnœa originating in this cause. It is rather a form of chronic bronchitis, and can scarcely be regarded as a combination of catarrh and asthma, as it has been by some.

Causes.—The prevalent idea is, that it arises from vegetable matter diffused in the atmosphere, that it is derived from the flowers of some plants, and that in a great number of instances it comes from grass. Dr. Elliotson asserts, that a lady, who had suffered from the disease for many years, told him, that being once away from home at an inn, where she conceived there was no danger whatever of being affected by the flowers of grass, she was suddenly seized with violent dyspnœa, and great irritation, and on looking out of a window, she saw that a cart-load of hay had just been brought into the inn-yard. She told him, also, as another proof, that the affection arose from this source, that her children once came into the room after having been

playing with hay, and instantly her breathing became affected. It is, however, against the idea of the effluvia from hay being a common exciting cause, that the haymakers themselves are said to be entirely free from it; and that it is often met with in towns, where such effluvia, if they exist at all, cannot be in any quantity.

The rarity with which the disease is seen sufficiently proves, that the predisposition lies in some idiosyncrasy, which is, at times, derived from progenitors. In a letter from Mr. Poyser, of Wirksworth, England, to Dr. Elliotson, he speaks of the mother of a large family, who had been afflicted with this malady for many years. "This lady decidedly considers the cause of her complaint to be an emanation from the flowers of grass. It begins when grass comes into flower. There is a perceptible increase or paroxysm, when she is exposed to these effluvia, and when the flowering time is over, she can go into a hay-field with impunity, which she could not previously do. The father of this lady is immediately seized with violent and continual sneezing, and inflammation of the nose and eyes, when he goes into, or approaches, a hay-field; but the symptoms go off when he is removed from the smell of hay. He, therefore, carefully avoids the exciting cause, and escapes the disease. Three of the sons of Mrs. A. are also subject to this disease, and their symptoms are similar to hers, though less severe. One of these young gentlemen is now at Geneva, and had the complaint there this summer." When a predisposition is laid in idiosyncrasy, the smell of the hay may act as an excitant cause; but in other instances it may be an emanation of a different kind. The odour of ipecacuanha is one of the most frequent excitants. The author knew a young gentleman who could not touch powdered ipecacuanha without the immediate supervention of every symptom of "hay asthma." With others, the same effect is induced by the smell of the rose, the bean-flower, &c. &c. In one of the sons of the lady, whose case is described by Mr. Poyser, all the symptoms of the disease are produced by the smell of the Guinea-pig; and an English nobleman is affected with sneezing and asthmatic symptoms, if he comes in contact with a hare, or rather with the fur of a hare, and remains ill for several days afterwards. He experiences great suffering whether the hare be dead or alive.

Moreover, cases of bronchitis of a periodical character and analogous in their phenomena to the affection under consideration, are occasionally met with, in which hay can by no means be invoked as a cause. An interesting example of this kind is contained in the following extract from a letter from a respectable physician of Virginia to the author's friend and pupil, Dr. John B. Grayson, of Virginia, who consulted the author in regard to the case.

"In June 1822, I was visited with an attack of the influenza, then prevailing epidemically; though it confined me to my bed several days, I took, as well as I can recollect, very little, if any medicine. This neglect perhaps I have cause to regret; in due time, I recovered; that is, all the symptoms left me, except the affection under which I still suffer, and to an intolerable degree. This chronic form of influenza is periodical in its character,—its attack almost always com-

mencing early in the morning, and continuing till after meridian, extending sometimes till the evening. I first feel a burning sensation high up the nostrils, which becomes exceedingly violent, so much so that I could tear my nose from my face, if it were possible. Excessive sneezing, with a copious discharge of serous fluid seems to be nature's relief of the present paroxysm. A heaviness of feeling succeeds like that experienced in a common cold. For several years after the original disease, the paroxysms, (I mean the severe ones) would occur about once in four or five days; seldom a day passing without a slight one. The disease I take to be one of irritation seated in the frontal sinus. I have discovered that counterirritants relieve, as long as they act, but no longer. I am free from it in bilious fever, but it returns with convalescence. I infer that an issue or seton would afford relief, but then it must be perpetual. I have used nothing for it of consequence except quinine; and from its periodical type, I have had a notion of trying the virtues of arsenic and quinine: from its irritative character, I have had thoughts of using the belladonna. I have for several weeks past enjoyed a mitigation of the symptoms, but I daily expect a recurrence of them in all their violence. For the last two or three years the disease has been much more severe and frequent in its attacks than formerly. The swelling and inflammation of the membrane of the nose will sometimes extend to the fauces, and even affect the glottis, threatening suffocation. The nasal passage for a considerable time is effectually closed, so that respiration is performed through the mouth alone. Sometimes, for the whole day I am totally unfit for the ordinary duties of life, and unfit also to be in company. It is remarkable, that frequently a horizontal position will suspend the paroxysm in the midst of its violence, but its return is sure on rising. Has the disease any affinity with tic douloureux?"

Treatment.—From the cases that have been detailed, it would not seem that any great advantage is to be derived from medicine. It has been affirmed, that the best prophylactic, before the period of expected recurrence, is the cold shower bath, accompanied by the internal use of the sulphate of quinia and the sulphate of iron, which, although not entirely compatible in a chemical point of view, form a compound, which has been productive of advantage.

R.—Quiniæ sulphat. gr. ij.—iij.
Ferri sulphat. gr. j.—f. pil.
Dose, one, three times a day.

This plan has been found so effective, that two persons, who had previously been most severely afflicted "were able to walk through a rich meadow without suffering in the slightest degree; although formerly, if they had ventured out into such a situation, they would have brought upon themselves all the agonies of spasmodic asthma." It has been advised, likewise, that the person should visit the seacoast during the period at which he is usually attacked, and the change, as might be presumed, whatever may be the cause, has often proved very beneficial. It is proper to remark, however, that the only instance said to be on record, in which the disease attacked a patient before the usual

period, was when he was residing for a few days, in an airy house, situate on a cliff overhanging the ocean. In one case, the patient almost entirely escaped the disease, by merely commencing, some time previous to the expected period of attack, to anoint the eyelids at bedtime with the *unguentum hydrargyri nitratis* properly reduced,[a] and by bathing the eyes occasionally during the day with a collyrium composed of rose-water and acetate of zinc;[b] and after this had dried, smearing them with simple spermaceti ointment to remove the stiffness left by the collyrium.

[a] R.—Ung. hydrarg. nitrat. p. i.
Adipis p. ix.—M.

[b] R.—Plumbi acet.
Zinci sulphat. ää gr. vi.
Aquæ rosæ f℥iv.—M.

In no case, perhaps, is the thorough revulsion occasioned by change of air, society, scenery, and diet, combined with the use of the various *douches* and of the wet sheet employed at the various hydropathic establishments more likely to be serviceable. Whatever good is to be derived must be from the communication of new impressions; and those referred to, if adapted specially to the case by a regular physician, are certainly powerful modifying agents.

When the disease has fairly set in, its course is not much influenced by remedies. Being chronic in its character, it does not well bear depletion. One writer has recommended the tincture of lobelia in the dose of f℥j. three times a day, which, he affirms, generally affords relief; and Mr. Worthington, of the Lowestoff Infirmary, has found the administration of a cup of strong coffee without sugar or cream, repeated every two hours, to be the most successful remedy. The sulphate of quinia failed in the hands of both these gentlemen.

Almost all the sufferers have experienced inconvenience from too rigid a diet, and from too free exposure to air. These facts must be borne in mind, as well as the circumstance, that the affection wears itself out in the progress of time, and without materially affecting the constitution. The practitioner should, therefore, avoid being too officious. Under the idea, that the cause was the effluvia from grasses—the pollen in all probability—and that such effluvia might be destroyed by the chlorides, Dr. Elliotson requested a gentleman, who had the disease, to sprinkle chlorinated soda around the chamber, and he did so with perfect success. In another case, saucers of a solution of one of the chlorides were placed about the bedroom; rags were dipped in the solution, and hung upon the backs of chairs; the hands and face were washed with it, night and morning: and the patient was directed to carry a small bottle of it about with him, and to smell it repeatedly in the course of the day. The result, in this case, was likewise satisfactory. In other cases, however, the plan has been by no means as beneficial; and even if it had been, the result would not be a sufficient proof, that the cause was the one assigned by Dr. Elliotson. No matter what might be the effluvium in the air, the chlorine could not fail to modify the condition of the latter, and thus to obviate, more or less, the morbific influence. It is clear, therefore, from the whole history of the affection, that the efforts of the practitioner can lead only to the palliation of the more urgent symptoms, and that, even in this

respect, his powers are extremely limited, and his attempts to afford relief too frequently either altogether nugatory, or productive of unexpected aggravation of the symptoms.

II. HOOPING-COUGH.

Synon. Bex convulsiva, B. theriodes, Tussis convulsiva, T. suffocativa, T. asinina, T. canina, T. clamosa, T. clangosa, T. ferina, T. spasmodica, T. pueros strangulans, T. quinta, T. stomachalis, Pertussis, Pneusis pertussis, Amphimerina, Orthopnœa tussiculosa, Bechorthopnœa, Morbus cucullaris, M. cuculus, Chincough, Kinkcough, Kincough, Kindcough; *Fr.* Coqueluche, Catarrhe ou Bronchite convulsive, Toux convulsive, T. quinteuse, T. bleue; *Ger.* Keuchhusten, Keichhusten, Krampfhusten, Stickhusten, Eselshusten, Schlafhusten, Brechhusten, Kielhusten, Blaue Husten, Convulsivische Katarrh, Epidemische Kinderhusten.

A variety of *nervous cough* is at times met with in nervous and hysterical persons, which is dry, sonorous, returns in paroxysms, and requires to be treated by revellents and narcotics, so as to excite a new impression on the nervous system. It is different, however, from the neurosis—if we may so term it—of the respiratory organs, which has now to be considered, and which has something special and specific in its character.

By the ancients, hooping-cough was confounded with other affections, unless we presume that it was unknown to them, and made its appearance, like some other diseases. at an after period. It seems to have been first satisfactorily described by Dr. Willis, in 1682, although it was a disease apparently well known.

Diagnosis.—Hooping-cough may be conveniently divided, as it has been by many writers, into three stages, although, it need scarcely be said, every such division must be artificial and arbitrary. The *first*—the *catarrhal stage* of some—essentially resembles ordinary bronchitis or catarrh. There is more or less indisposition, chilliness, depression, suffusion of the face and eyes, increased secretion of tears, sneezing, and discharge from the nose, along with a dry fatiguing cough, which returns by fits or *quintes*. During this stage, there is more or less febrile indisposition, with exacerbations during the night. This stage is very variable in its duration; at times, lasting for a few days; but, at others, for weeks. It does not often, however, exceed a fortnight. The *second*—the *nervous* and *spasmodic* or *convulsive stage*, of some—is known by the occurrence of the characteristic symptoms of the disease. The cough is now excessively violent and convulsive, and so distressing, that the patient, feeling its approach, runs to lay hold of, and support himself by, some object, until the paroxysm is ended. These come on more frequently during the night, and consist of a series of forced, quick, and unequal expirations, which follow each other so rapidly, that inspiration is impracticable. The return of blood is accordingly interfered with, and the face becomes swollen and livid; the tears are discharged copiously; the veins of the neck are prominent; a copious perspiration breaks out, and suffocation appears imminent. In a short time, however, small imperfect inspirations are effected, and then a slow, long, and distressing inspiration, accompanied by a peculiar noise, which has been compared to a *whoop*,—hence the name *whooping-cough* or *hooping-cough*; and, by others, to the braying of an ass, or the crowing of a cock; to which,

however, it bears but little resemblance, although names, descriptive of the notion, have been assigned to it, especially by the Germans. The cough sometimes ceases after this peculiar inspiration, but a second or a third may succeed, and the paroxysm may not wholly terminate until a viscid, ropy, colourless secretion is expelled with difficulty by expectoration, and often accompanied by vomiting. The sonorous inspiration is owing to the entrance of the air into the trachea through the glottis, the opening of which is spasmodically contracted. It is proper to remark, however, that the hoop is not always distinctive of the disease. An occasional hoop is not very uncommon in catarrh, especially in children who are teething. There is also a great resemblance—as remarked by MM. Rilliet and Barthez—between acute bronchitis and tuberculosis of the bronchial glands, and hooping-cough. In acute bronchitis, the cough recurs in paroxysms; but the hoop is rare and indistinct, and there is no expectoration or vomiting. It is also accompanied by intense fever, rapid respiration, anxious countenance, and extreme dyspnœa—the phenomena pointed out elsewhere as belonging to that disease. In tuberculosis of the bronchial glands, the paroxysms of cough are usually very short, and are unattended with hoop, or mucous expectoration, or with vomiting.

It is not uncommon for a tensive pain to be felt in the forehead; and it is a symptom which requires attention. Some, indeed, impressed by this encephalic sign, have placed the site of the pathological condition, which characterizes the disease, in the brain.

The duration of the paroxysms is from one to four or five minutes, and their occurrence is equally various,—at times, every five or ten minutes, but, at others, not oftener than six or eight times in the 24 hours. When they are not very long, or frequently repeated, the child resumes his play immediately afterwards; but when they return with great violence and frequency, dyspnœa, pain in the chest, and general indisposition remain. Their recurrence is immediately excited by mental emotion—as fright, crying—or by rapid running. They are commonly, also, more frequent after excitants of any kind have been taken; and where more than one in a family suffer, the occurrence of a paroxysm in one is very apt to excite it in another. It is not an uncommon occurrence for blood to flow from the nose, and occasionally from the mouth and ears, during the paroxysm; and for infiltrations to take place under the conjunctiva. In excessively severe fits of coughing, the urine and fæces are discharged, involuntarily; and where there is a liability to prolapsus of the rectum, or to hernia, these protrusions may occur under like circumstances.

Between the fits, there is little or no general indisposition, unless some complication exists. The duration of this period is very variable. On an average, it may be estimated at from a fortnight to a month, but it may continue for months.

The *third* stage or the *stage of decrement* or *decline* is indicated by diminution of the spasmodic phenomena,—the paroxysms of coughing becoming shorter and shorter, and less violent and frequent; the peculiar inspiratory noise, by which they terminate, diminishing, and ultimately disappearing. The liquid expectorated becomes opaque,

thicker, of a greenish hue, generally—and sometimes puriform. The cough at length does not differ from that of ordinary catarrh, and gradually ceases, especially if the disease have existed during the spring; if during the autumn, it may remain severe the whole of the subsequent winter.

The duration of hooping-cough is uncertain: on the average, it may be estimated at from six weeks to three months; but it may continue much longer.

If the ear be applied to the chest during a fit of coughing, no respiratory murmur is heard, because the air does not enter the chest; but the moment the pathognomonic inspiration takes place, the air is heard rushing into the ultimate bronchial ramifications, and the respiration becomes louder than natural. As there is no consolidation, percussion renders a clear sound, both during the paroxysms and in the intervals between them.

Hooping-cough is often complicated with other affections, as with bronchitis and pneumonia. Of 38 cases of complications, reported by M. Blache, 12 were of pneumonia; and of 28 cases, observed in 1836 by M. Constant, in the *Hôpital des Enfans* of Paris, ten were of the same affection. As a sequel of hooping-cough, tubercles are at times formed or developed, and, not unfrequently, serious encephalic affections ensue,—encephalitis, hyperæmia, and convulsions, which accompany every paroxysm of coughing, and are difficult of removal owing to the persistence of the cause. In the winter season, epidemics of hooping-cough are apt to be accompanied with inflammatory affections of the air-passages; and in summer, with affections of the alimentary canal, especially inflammation of the lining membrane.

Causes.—But little is known of the causes of hooping-cough. It is one of the diseases that reign epidemically; and, as has been more than once observed, we know but little of any of the diseases that occur under epidemic influences. It is rarely sporadic; and, as a general rule, attacks individuals but once; but to this rule there are many exceptions. A modern writer, W. England, states, that he had, at the time of writing, (May, 1840,) under his care, a boy, five years of age, labouring under hooping-cough, who had the same disease when about a year old. It is farther stated, that a maternal aunt and uncle of this child were twice affected with the disease—first when infants but a few months old; the aunt a second time, when seven years of age; and the uncle a second time when forty-five years of age. It prevails at all seasons and in all climates, and attacks every age and condition; but children are more liable to it than adults; and children, under the age of the second dentition, are affected in greater numbers than the older, excepting that it does not often attack children at the breast. Of 130 cases, recorded by M. Blache, 106 were under 7 years of age; 24 between 8 and 14.

When hooping-cough prevails extensively, the mortality from it is occasionally considerable. In Glasgow, the deaths have been pretty nearly 5½ per cent. of the whole number; and in one year, according to Dr. Watt, they amounted to 11¼ per cent. The statistical tables of Dr. Emerson, show that in Philadelphia it is more fatal to the female

sex, and such seems to be the case elsewhere. According to the census of Ireland for 1841, the deaths were 100 males to 115·43 females.

The disease differs from some other epidemics—as the influenza—in not affecting any great belt of country. It is commonly, indeed, restricted to a small sphere, and this is one reason why it has been conceived by some to spread rather by contagious than by strictly epidemic influence. Whether it be ever produced by contagion has, however, given rise to discussion. Many, amongst whom may be mentioned Stoll, Sprengel, Laënnec, Desruelles, and Professor Dewees, of Philadelphia, deny it altogether, but the large mass of observers do not hesitate to admit it: M. Wunderlich, indeed, affirms that the period of incubation is generally six days. With those who believe in its being a contagious disease, a question frequently arises as to the precise period at which it becomes, and ceases to be so. The author, who has been rather disposed to be a contagionist, has had no reason for believing that it has been communicated until the disease has been fully formed, or after the cessation of the whoop. Since the first edition of this work was published, his youngest child has had the disease severely,—the whoop continuing during the winter and spring for at least three months; yet none of the other children—not one of whom had passed through the disease—took it from her. Cases of similar exemption are by no means unfrequent.

Pathological Characters.—It is difficult to affirm positively what are the anatomical characters of this disease. It never terminates fatally, without inducing some other affection, whose traces are perceptible on dissection. This circumstance, with the phenomena during life, has caused it to be classed by distinguished pathological writers, amongst the *lesions of innervation of the bronchia.* In the great majority of cases, however, more or less redness is observable in the mucous lining of the bronchial tubes. This is at times general, but at others restricted in extent; and although by some it has been said to have been wanting, it has been maintained by others to be an invariable appearance. The small bronchial ramifications have been found filled with a mucous or a muco-purulent matter; and where the inflammation has extended to the lungs or pleura, or complications of disease of other parts have existed, their characteristic lesions have been seen on dissection.

A very common necroscopic appearance is dilatation of the bronchia, and, along with this, pulmonary emphysema is not uncommonly found, especially where the disease has existed for a long time. The bronchial ganglions or glands would seem to have been as often diseased as the bronchial mucous membrane. They have been found red, swollen or tuberculous.

Some have affirmed, that the pneumogastric nerves have exhibited evidences of inflammation, whilst by others no appearance of the kind has been met with.

With regard to the precise nature of the disease, much difference of opinion has existed, and still exists; but it is not advisable to dwell on points, which, in the existing state of science, appear inappreciable.

The view, most in accordance, perhaps, with all the phenomena, is that the disease consists in erethism of the nerves distributed to the bronchial mucous membrane, accompanied generally, if not always, in the first instance at least, by bronchitis. It has been found, that when the pneumogastric nerves were bruised and pinched in a living animal, so as to break down their structure, convulsive cough was excited like that of hooping-cough; and, again, it is well known, that if extraneous bodies be received into the air-passages, a spasmodic contraction of the glottis may occur with a hooping sound on inspiration.

Treatment.—This is generally palliative; for it rarely happens, that we are able to cut short the disease or to modify its course. The number of remedies, which have been brought forward, is immense, but the true plan is to treat the disease according to general principles; for neither in this, nor in any other disease, has a specific been discovered. The treatment may be divided into that which is applicable in the *first* or forming stage, according to the division of the symptoms laid down;—in the *second*, or convulsive stage, or stage in which the disease is fully formed: and in the *third*, or stage of decrement or decline.

The *first stage* requires the treatment that is demanded in subacute bronchitis. It is rarely necessary to take away blood from the general system, but should the symptoms seem to demand depletion, the application of leeches to the chest may be of service. In the *second stage*, a great variety of medicines has been prescribed; and perhaps the most efficacious of these are emetics. They may be given every three or four days, and even oftener, unless their administration should seem to be productive of bad effects. By some, they are given every day or two, for the first two weeks. Either the tartrate of antimony and potassa, or ipecacuanha, may be administered; the nausea dislodges the mucus from the bronchial tubes; and the immediately succeeding efforts at vomiting expel it. It has long, indeed, been observed, that those children, who vomit readily during the paroxysm, suffer the least; and this has been a great incentive to the administration of emetics. Purgatives are of no essential use, and are only prescribed under the general principles, which point out the necessity for their use in other cases. Narcotics have been greatly extolled, and certain of them more so than others. Belladonna has been preferred by many; so much so, indeed, that certain writers have regarded it as a specific in the disease. This is not the fact; but when pushed to the extent of affecting the brain—as indicated by vertigo, dimness of sight, dilatation of the pupils, &c.—it has arrested the violence of the paroxysms. Some, however, administer it in smaller doses, and are not desirous of producing narcosis.

℞.—Ext. Belladon. gr. ss.
Sacchar. alb. ʒj.—M. et divide in part. viij. æquales.
Dose, one, night and morning, for a child from two to four years old.

The effect of belladonna is, however, somewhat uncertain; in a very small dose, it may occasion symptoms of narcosis, and it is apt to lose its effect speedily, so that the disease continues stationary.

Various other narcotics, as opium, and its preparations, hyoscyamus, conium, lactucarium, tobacco, &c., have been administered with advantage in particular cases; but all—and especially the last—require care in their administration. Hydrocyanic acid, in the opinion of some, is almost entitled to the rank of a specific. By Professor Thomson, it is regarded as the sheet-anchor of the practitioner. After emptying the stomach with an emetic, and purging the patient briskly, he commences with the use of the acid, and never alters the prescription except to increase the dose; and Dr. Roe found its employment attended with such striking effects, that he could not entertain a doubt of its possessing "a specific power over hooping-cough." The result of all his trials convinced him, "that in warm weather it will cure almost any case of simple hooping-cough in a short time; that in all seasons it will abridge its duration; and in almost every instance, where it does not cure, that it will, at least, materially relieve the severity of the cough." It is proper to remark, however, that Dr. Roe always combined it with other agents, that have been recommended in the disease.

R.—Acid. hydrocyanic. (Scheele's), ℥xij.
Vin. antim. f℥j.
Tinct. opii. camphorat. f℥ijss.
Aq. camphor. f℥vijss.—M.

Dose, a tablespoonful, every four hours in some warm drink: "the child to remain in a warm room, and to live upon light pudding and broth." This prescription was for a delicate boy, four years old. For a healthy-looking female child, five years of age, Dr. Roe ordered the following mixture:

R.—Acid. hydrocyanic. (Scheele's), ℥xx.
Vin. antim. f℥iss.
—— ipecac. f℥iss.
Aquæ f℥xiij.—M.
Dose, a teaspoonful, every two hours.

It need scarcely be said, that it is not easy to deduce satisfactory inferences, as to the action of any one ingredient of a compound formula, every article of which, it is presumable, has been added to effect some definite object.

Narcotics have likewise been administered endermically with advantage; but unpleasant accidents have resulted from them, so that, even in this form, they must be employed with caution.

Very recently, cases have been recorded of the good effects of the inhalation of the vapour of ether; and Dr. Robert Willis affirms, that the paroxysms of coughing are positively cut short, by having a handkerchief and ether in readiness, pouring three or four drachms of the liquid upon the handkerchief, and directing it to be held close to the mouth and nostrils, when the paroxysm is about to come on. "So effectual," says Dr. Willis, "have I seen its immediate application, that I have ever found it necessary to suffer the patient to have an occasional fit of coughing to its natural termination, with a view to clearing the chest from accumulated mucus."

Various reputed antispasmodics—assafœtida, musk, valerian, castor—have been prescribed by some practitioners—and lauded—but the author has seen no effect from them, except what could be ascribed to their excitant agency,—or in other words, to the new impression made by them upon the nerves of the organs of taste, and of the stomach.

By recent observers, the subcarbonate of iron has been regarded as one of the best antispasmodics. M. Lombard gave it in the quantity of 24, and even 36 grains to young children, either in water or syrup, or mixed with a cough mixture. He never found it produce any inconvenience: on the contrary, he observed that all the children, treated after this method, recovered faster than with other remedies, and he considers himself justified in affirming, that it enjoys the property of making the paroxysms less violent, diminishing their number, and after a certain time of entirely curing the disease. The good effects of the iron are ascribed to its antiperiodic and antineuralgic properties; and these effects are considered to favour the idea, that hooping-cough resembles a true neuralgic, or at all events nervous, disease. Iodide of silver has likewise been recommended by Dr. Charles Patterson, Physician to the Rathkeale Infirmary and Fever Hospital. He gave it in several instances in the dose of from one-eighth of a grain to one-fourth, three times a day, with — he considered — decided relief; and M. Berger has found decided advantage "in the convulsive stage, where the indication is to combat nervous irritation," from the nitrate of silver in the dose of from one-sixteenth to one-twelfth of a grain,—at first three times, and afterwards four times a day. *Lobelia inflata*—which is an acronarcotic—has also been much recommended in spasmodic diseases of the air-passages, and, therefore, in hooping-cough.

R.—Tinct. lobeliæ gtt. xxx—xl.
Mucilag. acac.
Syrup. papav. āā f℥j.
Aquæ f℥vj.—M.
Dose, a teaspoonful, every two or three hours.

It has been regarded as infallible as the hydrocyanic acid has been by its supporters.

Alum has enjoyed some repute as a "specific" in this disease—but, like all specifics, not on much foundation. Dr. Golding Bird has prescribed it extensively, and considers it a valuable remedy in the second or nervous stage, after all the inflammatory phenomena have subsided. He has not met with any remedy which has acted so satisfactorily, or given such marked and often rapid relief. He generally prescribes it in doses of from two to six grains to children from one to ten years of age, repeated every four or six hours. For a child, two or three years old, he usually employs the following formula.

R.—Aluminis gr. xxv.
Ext. conii gr. xij.
Syrup. rhœados f℥ij.
Aq. anethi f℥iij.—M.
Dose, a dessert-spoonful, every six hours.

Dr. Bird never observed any inconvenient astringent effects from its use. Dr. Davies, in his recent edition of Underwood on the Diseases of Children, speaks in equally high terms of it.

Revellents have been greatly employed; but the more severe have generally been laid aside,—partly, because they are not more serviceable than the milder; and partly, also, because in young children, blisters and issues are apt to be followed by unpleasant consequences. In their stead, the ointment of tartarized antimony may be rubbed on

the chest or epigastrium, but care must be taken that the pustulation is not too extensive, as troublesome ulcerations have resulted from it. Croton oil has, likewise, been used in the way of friction.

R.—Ol. tiglii
— oliv. aa partes æquales.—M.
A few drops to be rubbed on the chest night and morning.

Various embrocations have been advised to the chest, epigastrium, and along the spine. They all act on the same principle. *Roche's embrocation* for hooping-cough has been much used.

R.—Ol. oliv. f℥xvi.
— succini f℥viij.
— caroyph. q. s.—M.

The oil of cloves is added merely as a scent, but this is not better than any of the ordinary excitant liniments, as the *Linimentum ammoniæ*, or the *Linimentum camphoræ compositum* of the Pharmacopœias. An asafœtida plaster to the chest, or between the scapulæ, has been highly thought of by many, and has, doubtless, at times been productive of advantage as a cutaneous revellent,—not in consequence of any antispasmodic virtue possessed by the asafœtida, inasmuch as other gently excitant plasters, similarly applied, have been followed by like good effects.

At the meeting of the Medical Section of the British Association, in 1840, it was stated, that rubbing the chest with cold water, repeated two or three times a day, with so much activity as to produce a rubefacient effect, was frequently of great use.

The warm bath is occasionally found serviceable in allaying the violence of the paroxysms.

Remedies have likewise been administered in the way of inhalation. Sulphuric ether, thrown upon the bed or on the clothes of the patient, speedily vaporizes, and has been conceived to diminish the violence and duration of the cough. The smoke of tobacco; the inhalation of the vapour from a hot decoction of belladonna, of the cherry laurel water, and of different aromatic substances, of the vapour of tar, and of nitrous acid, have likewise been advised, but their efficacy is so little marked, that they are scarcely ever employed.

When tensive pain exists in the forehead, a few leeches may be applied with marked advantage. It has been presumed, indeed, that the severity of the whoop may be, in this way, diminished; and that the fact is in accordance with the acknowledged influence of certain states of the brain upon the respiratory organs.

Lastly,—vaccination has been proposed as a method for curing hooping-cough; and there are many cases on record, which would seem to show the marked influence exerted by this new condition, artificially excited, on that which had possession of the economy. At the same time, it must be remarked, that it has often failed altogether. It may be well, however, to seize the opportunity for vaccinating, provided it has not been previously practised.

In the *third stage* or the period of decrement, advantage may be derived from the use of gentle tonics, as the cold infusion of cinchona, the infusion of gentian or colomba; and at this period, the excitant

remedies—external and internal, advised in chronic bronchitis—may be employed with as much prospect of success as in that disease. Change of air is, at this period, most important, and it is not essential, that the change should be from a worse air to a better. The inhabitants of Edinburgh frequently send their children from the airy parts of the town into the Cowgate,—a filthy street, which runs at right angles under one of the largest thoroughfares in the old town, and in which, at a certain hour of the night, the inhabitants eject all the offensive accumulations from their houses, to be washed away by the water of the reservoirs let on for that purpose; yet the change is often most salutary. Even the change from one room of the house to another has been found of benefit. The patient should be warmly clad, if the season require it, and wear flannel next the skin, whatever may be the season; and should take moderate exercise, and food easy of digestion, but not in too great quantity. Should the convalescence be tedious, and the cough and other signs of pulmonary disorder persist, change of air, society, and scenery, and, where practicable, if the winter be approaching, removal to a more genial climate, should be strongly recommended. In the summer season, the climate of the United States is amply adequate to all useful purposes, and several of its mineral springs afford localities that are very favourable for the complete restoration of the valetudinarian. The springs at Warrenton, in Virginia, afford an excellent sanitarium for such cases.

It need scarcely be said, that the different complications, which present themselves in the course of the disease, must be met by the modes of treatment recommended under their respective heads,—the circumstance being always borne in mind, that after the complication has been removed, strength is necessary for the support of the patient through a long and tedious malady, and that, therefore, all copious abstractions of blood should be made with a wise caution.

III. HEMORRHAGE INTO THE BRONCHIA AND LUNGS.

a. *Hemorrhage into the Bronchia.*

Synon. Hæmoptysis, Hæmorrhagia Pulmonum, Bronchorrhagia, Pneumorrhagia, Hæmoptismus, Hemoptoë, Emptoë, Emptoys, Sputum cruentum, Sputum sanguinis, Hæmorrhagia hæmoptysis, Spitting of blood; *Fr.* Hémoptysie, Crachement de Sang, Bronchohémorrhagie; *Ger.* Blutung aus den Lungen, Bluthusten, Blutspeien, Blutausfluss, Lungenblutfluss, Lungenblutung, Hämorrhagie aus den Luftwegen, Blutsturz.

Hemorrhage from the bronchial tubes is by no means a common occurrence; and although always an alarming disease, inasmuch as it is so often the announcement of the existence of pulmonary tubercles, yet when it is a simple exhalation of blood from the bronchial mucous membrane it is of comparatively little danger.

Spitting of blood is always alarming to the patient, no matter whether it proceed from the bronchial arteries, or from some of the vessels in or near the pharynx; although, in the latter case, the exhalation is of no greater consequence than is epistaxis in the same individual; hence, the number of cases of *spitting of blood*,—meaning by that term, hæmoptysis,—which are of no serious consequence. It is not generally difficult to diagnosticate these cases, and, conse-

quently, to separate an affection, which is of little or no consequence, from one that merits the greatest consideration. A practitioner boasted to the author of the great success, which attended his practice in hæmoptysis; but on inquiring closely into the cases, they were all examples of venous hæmorrhage—and to a small extent only—from the pharynx.

Diagnosis.—An attack of hæmoptysis is commonly preceded by more or less indisposition, and especially by a sense of weight, or heat, or an indescribable feeling of uneasiness about the chest, with oppression in the breathing, and cough—signs indicating hyperæmia or congestion of the lungs—and a sweetish taste, or the taste of blood in the mouth. With these local, are commonly associated general, symptoms; the extremities and surface of the body are cool; irregular chills are experienced, especially in the back; the face is alternately pale and flushed, and there is palpitation, with an accelerated, and at times vibratory, full, and hard pulse. A distressing sense of ebullition is also experienced in the chest, which has been esteemed a certain sign of blood being effused into the bronchial divisions. The constraint in respiration augments, and a sense of tickling and pricking is referred to the bifurcation of the bronchia. The expectoration of mucus streaked with blood, or of pure blood in greater or less quantity, now commences; and when the blood is examined, it is found to be of a florid vermilion colour, and frothy; unless it has remained some time in the bronchia, when it may be dark. Such is the case, when the exudation of blood is ceasing; the portions which transude, instead of being thrown off immediately, may remain there for hours, and be ultimately expectorated of a very dark colour.

The expectoration resembles red currant jelly; but, at times, it is not so much tinged. The quantity of blood evacuated varies; it is sometimes so great, that it almost amounts to vomiting—mouthful after mouthful being expectorated; the feelings of indisposition then gradually cease, but they may recur, and be followed by a similar hemorrhage. The quantity lost is, at times, astonishing, especially when it is vicarious, as in cases of suppression of the catamenia: in these cases it may return monthly. Laennec attended a young man who expectorated five kilogrammes (upwards of twelve pounds) in the space of forty-eight hours; and J. Frank cites cases in which the loss amounted to six, and even to fourteen kilogrammes in three hours! Cases have been seen, where extraordinary quantities of blood have been discharged, and the patient has sunk immediately;—but they are rare.

After a copious discharge, cough usually continues, with the expectoration of a slight quantity of dark liquid, or coagulated blood, which ceases gradually.

When the chest is percussed, it emits its natural sound, because the blood is expectorated as fast as it transudes: for the same reason, on auscultation, no sound may be heard except the mucous *râle* with large bubbles, (*râle muqueux à grosses bulles.*) Difficulty may occasionally arise in discriminating the blood of hæmoptysis, from that of hæmatemesis and epistaxis. In the last disease, the blood may flow by the posterior nares into the pharynx, and be expectorated along

with the mucus of those parts. The colour of the blood is strikingly different, however, from that of active hæmoptysis: it is never florid and frothy, as in the latter disease. The blood of hæmoptysis may be distinguished from that of hæmatemesis by the same signs, as well as by the accompanying symptoms. In the former disease, as we have seen, there is cough and dyspnœa; in the latter, nausea, weight at the epigastrium, and vomiting: on inspection, too, the blood evacuated may be found mixed with the contents of the stomach or small intestine.

The blood in hæmoptysis may proceed from the rupture of an aneurism of the aorta; but, in such case, there is not much time for doubt, as the case speedily terminates fatally.

As it very rarely happens, that hæmoptysis is a primary disease, and as it is almost always symptomatic of some internal lesion, it becomes important to determine the nature of such lesion, and especially, whether it consist in deposition of tubercles. In the latter case, the prognosis merges in that of phthisis pulmonalis, and the existence of tuberculosis must be determined by the symptoms to be described hereafter. Even where tubercles are not present, it may lay the foundation for them in one predisposed to them. It has been affirmed by a distinguished pathologist, M. Andral, that he has found less than one-fifth of those, who have laboured under hæmoptysis, exhibit tubercles on dissection. There are many, again, who have been hæmoptoic in their youth, who have attained a good old age, remaining delicate for a longer or shorter period, or entirely recovering. It is unquestionable, however, that in the majority of cases, hæmoptysis is either preceded or followed by phthisis pulmonalis.

It does not appear to be practicable to decide whether the blood proceeds from the pulmonary artery or from the bronchial arteries. At first, it might be inferred, that the blood of the pulmonary artery must be black, whilst that of the bronchial arteries is florid; yet it is obvious, that the exposure of the black blood of the pulmonary artery to air must convert it into red blood; and, on the other hand, if the blood of the bronchial arteries remains for a time in the bronchia, it may become black.

Causes.—The predisposing causes of hæmoptysis are numerous; the phthisical habit—to be described hereafter—and any organization, in which the vessels are loosely protected by the parts in which they creep, offer a predisposition. This is apt to be the case in that organization, which has been esteemed markedly strumous, in which the hair is fair, the eyes blue, and the pulse rapid. Age is, likewise, a predisposition. In infancy and advanced life, the disease is rare; but soon after puberty, when, owing to the different evolution of organs, the disposition to epistaxis has ceased, the tendency is much greater; and again, after the age of 35, when the evolution takes place that favours cerebral hemorrhage, the liability to hæmoptysis is greatly lessened. Between the ages of 15 and 40 may be regarded as the period most subject to the disease.

Women, it is affirmed, are more liable to the affection than men. As regards the hæmoptysis of phthisis, M. Louis found the proportion

of females to males to be as 3 to 2. Any sudden changes of atmospheric pressure may have some influence; that is, a change from a denser to a rarer condition, provided it be considerable. We might suppose, therefore, that persons, who live in elevated regions, as on the mountains of South America and Thibet, or the Alps, would be subject to hæmoptysis, and such—it has been affirmed—is the fact. The system, however, probably becomes soon accustomed to the altered circumstances, and we have no sufficient data for believing, that, ultimately, such persons are more liable to serious hæmoptysis, and other affections of the pulmonary apparatus, than those who reside on the level of the ocean. It has been asserted, that attacks of spitting of blood are more frequent in spring and autumn, when the days are warm, and the mornings and evenings cool, than at other seasons; but the author is not able to say, that he has observed any influence exerted by seasons. The same may be said of the hour of the day. His observations have not led him to infer, that most of the attacks occur in the night or morning.

The exciting causes are very numerous. Violent corporeal exertion, either of the lungs or of the body generally, may induce it, especially if any of the predisponent influences, already described, be in action; or if there be either vascular fulness, or mechanical impediment to the circulation, owing to the presence of tubercles in the lungs. One of the most severe cases of hæmoptysis, which the author has attended, occurred in the act of sexual intercourse. In the advanced stages of pulmonary consumption, hæmoptysis may be a symptom of the existence of abscess in the lungs. The inhalation of fine mechanical particles, borne about in the air, in certain occupations, or of acrid vapours, may also be an exciting cause.

Pneumonia is attended with some exhalation of blood, but this is generally to a slight extent. Inflammation, therefore, of the pulmonary parenchyma may be regarded as a cause of hæmoptysis, and any induration, or hypertrophy, or dilatation, or protracted palpitation of the heart, or organic disease of any of the viscera by interfering with the due circulation of the blood, may give rise to hyperæmia in the lungs, which may terminate in the exhalation of blood into the bronchial tube. In like manner, pregnancy, or the improper pressure exerted by corsets too tightly applied, may induce it. It succeeds, at times, to the suppression of accustomed evacuations, as of the hæmorrhoidal or menstrual flux, and recurs periodically at the times when these fluxes have been expected. The condition of the blood has likewise its effect in favouring hemorrhage, and this, we shall see, has to be borne in mind in the treatment. If the blood be thin,—that is, if it contain a larger proportion of serum than of red globules or fibrin,—it will more readily transude through the parietes of the vessels; hence, hæmoptysis is occasionally seen in scorbutus, and in chlorosis.

Some singular cases are recorded, in which unusual agencies have acted in the way of causes. Thus, music, it is affirmed, has induced it in many persons affected with phthisis. In other cases, it has supervened on the application of leeches, or of a blister or sinapism; and,

on the other hand, these means will frequently arrest it. The author had a case recently under his charge, in which the patient felt the sensation as if the blood were drawn internally towards the part of the chest to which any form of counter-irritant was applied, and spitting of blood invariably followed. We are told again, of persons who could not partake of particular articles of diet, or inhale particular odours, without this affection supervening. Such, however, are rare cases—exceptions to the general rule.

It has been asserted, that hæmoptysis may be caused by a prolonged mercurial treatment, or after a long use of the preparations of iodine; but although the author has had ample opportunities for seeing both these therapeutical agents used to a great extent, he has never witnessed this result.

Pathological Characters.—In a case of simple exhalation from the lining membrane of the bronchial tubes, the membrane may or may not present signs of a morbid condition. It has been found more or less red, livid, and tumefied, and, at other times, pale, and exanguious. Commonly, it is covered with blood, and, on its surface, a number of red points may be observed on careful examination; but there is usually no trace of ulceration or of rupture. The flow of blood takes place by transudation or diapedesis; not by rhexis or rupture of vessels, as was at one time universally believed: we still, however, constantly hear of a hæmoptoic individual having *broken a blood-vessel* in his lungs. The mucous membrane is usually a little softened, and impregnated or tinged with blood throughout its substance. This softened condition is the main cause, perhaps, of the sanguineous exhalation. To detect a ruptured vessel, it may be necessary to throw in an injection, and to examine the lung under water.

Treatment.—When hæmoptysis is slight, occurs in one enjoying good health, and is merely limited to sputa tinged more or less with blood, the simplest means are sufficient for its removal. It is but necessary to inculcate mental and corporeal quietude, silence, a restricted diet, the occasional use of a brisk cathartic,[a] and, if much plethora, or sense of tightness about the chest exist, general or local bloodletting.

[a] R.—Jalap. p. gr. xv.
Hydrarg. chlorid. mit.
Zingib. pulv. aā gr. v.—M.

It was at one time the belief with the profession, and still is with the vulgar, that in all cases of hæmoptysis, as of other hemorrhages, astringents should be employed; but the case is not so simple. The pathological cause of the hemorrhage must be appreciated, and the disease be treated accordingly. If the hæmoptysis be attended with symptoms of vascular fulness or activity, bloodletting, and the agents belonging to the classes of sedatives and refrigerants, are chiefly indicated. Usually, when a person is attacked with hemorrhage from the lungs, the greatest alarm is felt, and, in all cases, it is expected, that the practitioner should have recourse to bloodletting to arrest the flow. The fact, however, is, that the loss of blood may be arrested at a less expense of fluid, when due attention is paid to ventilation, pos-

ture, &c. than when the lancet is used. A coagulum soon forms around the transuding vessel, and the hemorrhage ceases. Whether bloodletting have to be practised must depend upon other grounds—upon the results of an inquiry into the state of the circulation, general and capillary, connected with the hemorrhage. Should there be evidences of plethora, or of hyperæmia, the quantity of the circulating fluid must be diminished, otherwise, the hemorrhage may recur—care being had, as in every case of hemorrhage, not to allow too much fluid, but rather advising, that a small piece of ice should be taken into the mouth occasionally, for the purpose of allaying thirst and undue excitement. Bloodletting is one of the most powerful sorbefacients we possess; and if, immediately after it has been practised, fluid be freely allowed, it will pass at once into the blood-vessels, so that the quantity of blood circulating in the vessels may be as great, soon after the operation, as it was before; but it will be blood containing a larger proportion of watery contents, and, therefore, better adapted for transuding through the parietes of the vessels. If such be the case after a single bleeding, it can be readily seen that repeated bleedings, under similar circumstances, cannot fail to increase the evil, by laying the foundation for returns of the hemorrhage.

The effect of bloodletting on the composition of the blood is strikingly exhibited in the following analyses by MM. Becquerel and Rodier.

Mean composition of the blood of ten persons bled three times.

	First bleeding.	Second bleeding.	Third bleeding.
Density of defibrinated blood,	1056·0	1053·0	1049·6
Density of serum,	1028·8	1026·3	1025·6
Water,	793·0	807·7	833·1
Solid residue,	207·0	192·3	176·9
Fibrin,	3·5	3·8	3·4
Albumen,	65·0	63·7	64·6
Bloodcorpuscles,	129·2	116·3	99·2
Extractive matters, and salts,	7·7	6·9	8·0
Fat,	1·662	1·584	1·530
Consisting of serolin,	0·026	0·088	0·012
phosphorized fat,	0·637	0·489	0·450
cholesterine,	0·106	0·156	0·149
saponified fat,	0·893	0·851	0·919

The salts contained in 1000 parts of blood were,

Chloride of sodium,	2·8	3·5	3·0
Other soluble salts,	2·6	2·5	2·7
Phosphates,	0·404	0·493	0·348
Iron,	0·513	0·471	0·468

The symptoms that precede, accompany, or follow the hemorrhage, must be the guides to the abstraction of the blood; and should it be accompanied by a sense of heat or pain in the chest, constant or frequent cough, dyspnœa, and the pulse be, at the same time, full and hard, bloodletting may be practised, and repeated at the discretion of the practitioner.

In this country, during the flow, it is very common for the patient to be directed to take common salt into the mouth, under the idea that it possesses hæmastatic virtues. The author has never had the slightest reason for believing, that it has been productive of any advantage,

nor can he see under what principle it has been recommended. It has been already remarked, that, after a time, the hemorrhage ceases, whether salt have been employed or not; and hence it has probably happened, that the result has been ascribed to the salt, when it may have exerted no agency. By some of the European writers, as by M. Andral, it is referred to as a remedy employed in Philadelphia! M. Valleix, in his elaborate work, passes it by without notice.

In cases of active hemorrhage, where the loss of blood, and the use of ice, with the other means above recommended, are insufficient to reduce the vascular action, tartarized antimony and ipecacuanha have been used, with the view of inducing the sedation that accompanies nausea. Digitalis has, likewise, been recommended for the same purpose. It may be given alone,[a] or in combination with hydrocyanic acid.[b]

[a] R.—Digit. pulv. gr. j. vel
Tinct. digit. gtt. x. ter die.

[b] R.—Tinct. digit. gtt. xl.
Acid. hydrocyanic. gtt. vj.
Mucilag. acaciæ f℥iij.
Aquæ f℥iiiss.—M.
Dose, a fourth part every four or five hours.

The objection to digitalis is, that its effects are not immediate; still, there are many cases in which ample time is allowed for them to be elicited.

Amongst the most valuable of the remedial agents in hæmoptysis are revellents, of which there are various kinds. Dry frictions may be made over the surface; and, as the recession of the vital activity from the extremities is one of the common precursors of an attack of hemorrhage, it is important to solicit the blood towards them, by sinapised pediluvia, or by sinapisms to the feet, calves of the legs, arms, &c. Dry cupping over the surface of the body has, likewise, been recommended; and when the hemorrhage has taken place, some have advised, that ligatures should be put around the limbs, with the view of modifying the circulation. The plan is not, however, much employed, although we are satisfied it has occasionally been of advantage. Flying blisters, applied here and there, have been advised, but they have been thought contraindicated, where bleeding had been pushed to a great extent, in consequence of the irritability thereby engendered. There can be no question, indeed,—as the author has elsewhere pointed out, (*General Therapeutics and Mat. Med.*, 3d edit. ii. 151, Philada. 1846), that excessive loss of blood developes the nervous irritability, and that mischief is apt to be induced from this cause. When bloodletting from the arm is practised, whilst the hemorrhage is taking place from the lungs, it belongs to what were formerly termed "revulsive bleedings,"—the flow of blood being solicited towards the open vein, and, therefore, deriving from the "determination" towards the bronchial mucous membrane. On the principle of revulsion, the application of leeches to the anus has been strongly advised; and, for the same reason, it has been recommended not to apply them, or the scarificator, or blisters, over the chest.

Although the equalizing and revulsive operation of emetics might be of service in hæmoptysis, it has been conceived, that the activity they occasion in the vascular movements might do more harm than their

other operations could do good. Yet it has not been found, that hæmoptysis, symptomatic of phthisis, has been increased at sea, during the retching of sea sickness.

The revulsion, excited by cathartics, may be used beneficially, after the hemorrhage has ceased. During the attack, their operation might be injurious, in consequence of the corporeal disquiet they induce. Saline cathartics, which operate on the different tracts of the intestinal canal, and augment the secretion from the mucous membrane, ought perhaps to be chosen.

R.—Magnes. sulphat. ℥vj.
Acid. sulphur. dilut. gtt. xij.
Aquæ menthæ f℥iij.—M.
Dose, one half, to be repeated in three or four hours, if necessary.

Where blood is flowing copiously from a vessel, the idea would at once present itself, that astringents should be employed; and, before philosophical views of pathology were entertained, these were the agents universally had recourse to. Whenever hæmoptysis is attended with symptoms of vascular fulness or activity, the agents already described act as indirect astringents, and but little reliance is placed upon any of the articles of the materia medica, which are regarded as direct astringents, as none of them can be made to come in contact—except in a very dilute state—with the vessel whence the blood proceeds. Most astringents are, however, tonics, and, in cases of asthenic hemorrhage, may be serviceable in this way, from the improvement they produce in the general system; whilst others have the power, at the same time, of modifying the condition of the blood, and rendering it less fitted for ready transudation through the parietes of the vessels.

Almost all the agents that belong to the class of astringents have been given in hæmoptysis. Sulphuric acid, in a dilute state, or in the form of the elixir of vitriol, (gtt. viij.—x. in a glass of water,) is a common remedy; or a lemonade, made of dilute sulphuric acid, lemon peel, sugar, and water; but, if the experiments of Magendie can be relied on, sulphuric acid does not favour the coagulation of the blood, but the contrary. Alum, kino, extract of krameria, &c. &c. have likewise been favourites with some. In regard to the acetate of lead, much difference of opinion has existed. Some have regarded it as the most potent of all remedies, (gr. ij. iij. iv. in pill, every three or four hours,) after plethora has been reduced. Tannin, also, has been highly extolled.[a] It occasions constipation, which may be removed by enemata.

[a] R.—Acid. tannic. gr. iv.
Acaciæ pulv. gr. xvj.
Syrup simpl. q. s. ut fiant pilulæ viij.
Dose, one, every three hours.

From the powers of creasote as a hæmastatic, it was certain to be employed in hæmoptysis: and testimony of its efficacy has been adduced. In the hands of some, however, it has proved of little avail. The author has used it on one or two occasions, and he thinks with advantage.[a]

℞ R.—Creasot. gtt. v.
Mucilag. acac. f℥iij.
Syrup. f℥j.—M.
Dose, a spoonful, every three hours.

From the effect which it exerts on the coagulability of the blood, it seems well adapted for cases in which there is too great tenuity of that fluid. The same may be said of the iodide of iron, which the author has prescribed with the best effects, (gr. ij. or iij. in solution in water, three or four times a day.) Its property of coagulating the blood, and, therefore, of inspissating it, renders it especially valuable in hemorrhage, occurring in pathological conditions of the system, in which there is paucity of red globules, and too great a proportion of liquor sanguinis.

In hæmoptysis occurring in the chlorotic female, Mr. Lane has found much benefit from the use of half-grain doses, twice a day, of the oxide of silver; and Sir James Eyre affords similar testimony.

By Dr. Copland, the oil of turpentine, to whose action on the system he has long paid attention, is regarded as one of the most valuable remedies in internal hemorrhages, and as adapted to both the active and passive forms. In large doses, after the temporary excitement of the nervous system has passed away, it is considered to act as a sedative, and therefore to be adapted to the more active cases; and in smaller doses to the passive. A recent writer, Dr. Willshire, thinks it is "one of the most able weapons in the hands of the practitioner." It is absorbed into the circulation, and acts immediately on the affected capillaries. Dr. Willshire affirms, that it acts more quickly than any other astringent; and he has seen hæmoptysis, which had continued in spite of other remedies, yield at once to it.

Hæmoptysis has occasionally recurred in an intermittent manner, and has been arrested by the sulphate of quinia. Both this, and the iodide of iron, as well as other tonics, may be administered, whenever the hemorrhage is of an asthenic character, and when the catenation of symptoms resembles scurvy.

During the whole course of active hæmoptysis, the diet should be that of any febrile affection, except that fluid should be less freely allowed. The diet ought, indeed, to be as dry as possible; and, to allay thirst, small pieces of ice may be taken into the mouth, or iced lemonade may be sucked through a rag. When the fever has abated or disappeared, more nourishing aliment may be allowed; but everything must be taken cold. Farinaceous vegetables with milk—as arrowroot, sago, rice, &c.—should form the main diet, and every care be taken to avoid mental or corporeal agitation. All unusual exertion of voice or of body must be avoided; and the effects of vicissitudes of temperature and of consequent irregularity of circulation be obviated by flannel worn next the skin, and if this should fail, removal to a milder climate may be advisable.

b. *Hemorrhage into the Lungs.*

Synon. Apoplexia Pulmonalis, A. Pulmonum, Pneumorrhagia, Infarctus hæmorrhagicus pulmonum, Pulmonary Apoplexy; *Fr.* Apoplexie Pulmonaire, Hémoptysie foudroyante, Hemorragie interstitielle du poumon; *Ger.* Lungenschlagfluss, Lungenblutschlag.

By many, pulmonary apoplexy is reckoned as a form of hæmoptysis, and is considered under that head. There is, however, pathologically, a well-marked difference; in the latter case, the blood is exhaled from the bronchial mucous surface, whilst, in the former, it is effused essentially into the pulmonary parenchyma itself. The affections are, however, so congenerous, that it may be advisable to consider hemorrhage into the lungs immediately after hemorrhage from the bronchial tubes.

Hemorrhage into the lungs is not very uncommon. It has been affirmed, indeed, by M. Rostan, to be common, but he remarks, in another place, that it is somewhat rare! In some cases, it has destroyed instantaneously by asphyxia, but, generally, it is announced by a manifest train of symptoms.

Diagnosis.—The attack is commonly very sudden, and is marked by great dyspnœa, amounting, at times, to a threatening of suffocation. The movements of the thorax are hurried and unequal, exhibiting, indeed, the greatest possible irregularity; and the accompanying anxiety is intense. The characteristic physical signs have been considered to be:—absence of the respiratory murmur over a portion of the lung of no great extent, and a crepitant rhonchus around the part. But these signs would not appear to be constant, and, in many cases, it would seem, percussion and auscultation have afforded no information. The expectoration of a black fluid, devoid of fœtor, and resembling a solution of liquorice juice, has been esteemed a more positive sign, as indicating a collection of blood, which has undergone some change prior to its expulsion.

Where the blood is, at the same time, poured into the air cells, the quantity expectorated may be enormous. Pulmonary apoplexy is, however, for the most part, unaccompanied by hæmoptysis. In seventeen fatal cases, observed by M. Louis, hemorrhage from the air passages occurred only in two instances.

Causes.—In the generality of observed cases, the hemorrhage has occurred in persons labouring under heart disease, or pulmonary consumption. One of the most rapid cases which the author has seen was that of a young gentleman who was travelling for his health, and was, at the time, affected with manifest tuberculosis of the lungs, which had gone on to softening.

Pathological Characters.—Portions of the lung, usually restricted to a few inches in extent, are found of a deep red colour, having a density similar to that of the lung when hepatized by inflammation—appearances which are not modified by ablution. When these portions are divided by the knife, coagulated blood is generally found in the centre, which is, of course, entirely devoid of organization. The parts of the lung, surrounding the seat of the apoplexy, are crepitant, and separated from the apoplectic portions by a well-marked line of demarcation. Careful examination often exhibits laceration in the pulmonary tissue. The hardness of the affected portions is owing to the absorption of the more liquid parts of the blood.

Treatment.—The plan of treatment, laid down by almost all, is to bleed copiously, and not to be prevented from this course by apparent

debility, or feebleness of pulse. It has been properly remarked, however, by Dr. Mackintosh, that the plan of bleeding, in every case of bloody discharge from the lungs, is very objectionable; because it is bleeding for a name, without pathological considerations. The objects with which bleeding should be practised may be—to diminish the quantity of the circulating fluid; or, by inducing syncope, to arrest the flow; or to change the direction of the blood towards the artificial outlet. A more remote object may be—to favour the absorption of the blood already effused. In plethoric individuals, there can be no doubt of the propriety of this course, pushed as far as the symptoms, in the individual case, may indicate; but where the disease occurs in oligæmic individuals, the caution which was advised under Hæmoptysis, and the various revellents and other agents, recommended under the same head, are equally appropriate here.

IV. HYPERÆMIA OF THE LUNGS.

Synon. Stethæmia, Hyperæmia seu Congestio Pulmonum seu Pectoris, Congestion of the Lungs; *Fr.* Hyperémie des Poumons, Congestion des Poumons; *Ger.* Blutanhaufung der Lunge, Brustcongestion.

From the anatomical arrangement of the lungs, the fact that they receive the blood of the whole body, the variation in the frequency of the respiratory movements, and in the action of the heart, it can be understood, that these organs ought to be especially liable to irregular congestions of blood. It rarely, perhaps, happens, that such congestions are idiopathic. Still, such cases do occur, as will be seen hereafter. The first stage of inflammation of the lungs is always perhaps, one of hyperæmia, which, as a distinct affection, has been but little regarded until of late, when it has received attention from excellent observers—from MM. Rostan and Grisolle, for example—and especially from the latter. It may occur actively or passively, and is, at times, produced in a purely mechanical manner.

Diagnosis.—In active hyperæmia of the lungs, a sense of oppression and of distressing constriction or of fulness is experienced in the chest, which is frequently accompanied by a feeling of heat there, and a slight acceleration of the respiratory movements. When cough exists, it is short, light, dry, or followed by expectoration of white, slightly viscid sputa, often, according to M. Grisolle, streaked with blood. Along with these phenomena, the cheeks may be more or less injected, whilst a general plethoric condition, more or less marked, may exist, but without any febrile condition. According to M. Rostan, the cough and expectoration are most frequently absent, the dyspnœa, oppression, and flushing of the face, being frequently the only functional phenomena, that lead to the suspicion of the existence of the affection, even when somewhat considerable. When it supervenes in the course of another disease, it may remain more or less latent.

Not much information is afforded by percussion, even when hyperæmia of the lungs exists to a marked degree. When it is considerable, however, and affects the superficies of the lungs, percussion over the corresponding part of the chest may be somewhat less clear.

On auscultation, the respiratory murmur over the affected parts is found to be diminished, but without any increase of the vocal resonance. In rare cases, however, according to M. Grisolle, independently of the feebleness of the respiratory murmur, occasional mucous or subcrepitant bubbles are heard, indicating that a slight exhalation has taken place into the bronchial tubes or into the air-vesicles. In this manner, the limits of the congested portion may be indicated. In the majority of cases it is found to be at the posterior and lower part of the lung.

Idiopathic hyperæmia would seem to supervene most commonly in a sudden manner; and, when excessive proves fatal—at times, very suddenly. MM. Devergie and Lebert, indeed, regard it as a very common cause of sudden death. Of 40 cases of sudden death observed by the former, 24 seemed to be caused by congestion of the lungs—alone or associated with congestion of the brain.

Passive hyperæmia of the lungs is apt to occur in the course of most severe and protracted diseases, and in persons greatly debilitated from any cause, who are compelled to assume for a long time the horizontal posture. This is the cause of those hypostatic congestions of the lungs that are not unfrequently met with at the base and posterior parts of the organs. These passive congestions supervene slowly; are at times indicated by no special functional phenomena; but at others by those which have been described as present in active hyperæmia of the lungs; whilst the physical signs are identical. Usually, both the active and passive forms terminate by resolution; but both may lay the foundation for pneumonia, and M. Grisolle considers he has demonstrated that passive hyperæmia of the lungs is one of the most potent causes of the pneumonia which supervenes so frequently in the course of many acute and chronic maladies.

Causes.—It is obvious, that anything, which gives occasion to difficulty in the transmission of blood through the lungs, may be a cause of pulmonary congestion. Hence, violent exercise, sudden emotions, sudden transitions to air of different density and temperature may act as causes; but their effects are commonly as transient as they themselves. In the cold stage of intermittents, and at the commencement more especially of remittent and continued fevers, and during the paroxysms of epilepsy and hysteria, it is often also present. Tuberculous depositions in the lungs are a common cause of mechanical hyperæmia and consequent hæmoptysis; and diseases of the heart, by rendering the transmission of blood through the lungs irregular, produce a similar effect. Such are the causes of active congestion. From what has been already said it will be understood, that the passive form occurs in long-protracted and debilitating diseases; and especially in affections of the heart caused by narrowness of the orifices and cavities.

Pathological Characters.—The presence of a greater quantity of blood in the organs than in health constitutes the anatomical characters of pulmonary hyperæmia. When the lungs are examined, the congested parts are of a bluish or livid appearance externally. When placed in water, they swim imperfectly; their specific gravity being augmented. Their tissue is less crepitant, and when they are cut into,

a quantity of black fluid blood escapes, mixed with a reddish serous liquid. Commonly, the congested portion is not friable, but at times it is. This is not, however, a very satisfactory appearance; for, as M. Andral has observed, whenever the blood has accumulated in the lungs in such quantity that the organ contains more blood than air, the finger, pressed on the pulmonary parenchyma, readily penetrates and crushes it. It has been said, that in simple hyperæmia washing and malaxating the affected lung in water will restore it to its proper colour and consistence, whilst in inflammatory enlargement, it restores the colour but not the consistence, which remains friable; but this has been contested, and it is admitted by MM. Rostan and Grisolle to be impossible to distinguish simple congestion from the splenization of pneumonia in the first stage; and the former admits that it is far more by the consideration of the phenomena observed during life, than by the examination of the morbid appearances after death, that we are enabled to determine the true nature of pulmonary hyperæmia. Mistakes are doubtless often made by pronouncing mere cadaveric hyperæmia to be the engorgement of the first stage of pneumonia. During winter, it has constantly fallen to the author's lot to exhibit to his class such appearances when there have been no signs whatever of pulmonary inflammation during life. This is especially the case in every form of death from asphyxia. If the action of the lungs ceases before that of the heart, and blood continues to be sent, for a time, into those organs, the blood may accumulate in the vessels of the lungs, and give rise to the splenization and other appearances that belong both to hyperæmia of the lungs, and to the first stage of pneumonia.

Treatment.—In active hyperæmia of the lungs, blood should be drawn from the general system, and the whole antiphlogistic treatment be adopted. Cathartics employed as revellents to the intestinal canal; and dry cupping or blisters to the chest should likewise be prescribed. According to M. Grisolle, the use of revellents to the exterior of the chest has been deprecated, but it is not easy to see on what grounds. He himself speaks well of them.

In long-protracted affections where hypostatic congestions are apprehended, the position of the patient should be changed frequently when it is practicable. In the adult and the aged this is not so easy; but in the case of children it is readily accomplished. Bleeding can rarely be demanded in these passive cases; yet a small quantity of blood drawn from a vein may solicit the flow towards the surface and be beneficial as in other cases of internal congestion; and it may be even advisable to administer stimulants internally at the same time. Of course, where the debility is excessive, stimulants alone are indicated; but such cases generally resist all remedies.

V. INFLAMMATION OF THE LUNGS.

Synon. Inflammatio pulmonum, Pneumonia, Empresma pneumonitis, Peripneumonia, Pneumonia peripneumonia, Pneumonitis, Pneumostasis, Peripneumony; *Fr.* Pneumonie, Péripneumonie, Fièvre pneumonique, Fluxion de poitrine, Inflammation du parenchyme pulmonaire; *Ger.* Lungenentzündung, Entzündung der Lunge.

The definition of pneumonia, given of late years, by some of the best observers, is—inflammation of the parietes of the pulmonary

vesicles or air-cells, or of the intervesicular cellular tissue, or of both combined. If, however, we regard the vesicles or air-cells to consist of the terminal extremities of the bronchial tubes, it is difficult to separate pneumonia from bronchitis, which, as we have seen, is an inflammation of the mucous membrane of the bronchia. It is presumed, however, that the small tubes are not lined by a mucous membrane, and hence it may be supposed, that pneumonia is an inflammation of the cells and minute tubes; and a recent writer, just cited, believes, that "it differs from bronchitis in the ordinary acceptation of the term, merely in the occurrence of a parenchymatous inflammation, such as solidification, suppuration, and abscess, phenomena not proceeding from any inherent difference in the diseases, but a result of anatomical structure." Dr. Stokes elsewhere remarks, that "he who would call pneumonia a bronchitis of the terminal tubes, would be hardly guilty of a misnomer." Dr. C. J. B. Williams believes the seat of pneumonia to be in the capillary tissue of the pulmonary artery and veins. The most correct definition, perhaps, would be—"inflammation of the terminal extremities of the bronchial tubes and of the cellular structure connecting them."

It has been a belief with some, that the extension of inflammation from the small bronchial ramifications to the intervening cellular tissue is very rare, and hence that pneumonia is a very uncommon result of bronchitis. The author is satisfied that it is a frequent occurrence. The two affections are often seen together, and in many cases the bronchitic symptoms have decidedly preceded those of pneumonia.

Inflammation of the lungs may admit of three divisions for convenience of description; *a.* the *acute; b.* the *chronic;* and *c.* the *typhoid.*

a. *Acute Inflammation of the Lungs.*

Inflammation of the lungs has received various epithets, according to the part of the lungs implicated. When the air-vesicles are presumed to be affected alone, or chiefly, it has been termed *vesicular pneumonia.* When the inflammation implicates circumscribed portions of a lobe or lobes—a form almost peculiar to childhood—it is termed *lobular pneumonia;* and when the whole of a lobe or the greater part of it is concerned, it is termed *lobar pneumonia. Double pneumonia* is when both lungs participate in the inflammation, as is commonly the case in children; and *pleuropneumonia* is the term applied to the disease, when the inflammation affects at the same time both the lungs and pleura.

Lobar pneumonia occurs more frequently in the inferior, than in the superior lobes. Of 88 cases referred to by M. Andral, the inferior lobe was inflamed in 47; the superior in 30; and in 11 cases the whole lung was implicated. From the combined observations of several distinguished pathologists, it would appear, that in 1430 cases, the right lung was concerned in 742; the left in 426; and in 262 the disease was double. It is probable, however, as has been suggested by Dr. Stokes, that the proportion of cases of double pneumonia is

underrated in the estimate. It is very much more common in young children and old persons than in adults. Of 128 cases observed in infancy, according to MM. Valleix and Vernois, the disease occurred in the right lung in 17 cases; in the left lung in no case; and the pneumonia was double in 111 cases. Of these 111 cases, the disease predominated on the right side, 58 times; on the left, 10 times; and it was equally on both sides, 42 times.

Of 264 cases observed by M. Grisolle, the upper lobe appeared to be the first to suffer in 101; the inferior in 133; and the middle third of the organ in 30. Like other observers, however, he found that the tendency to disease of the upper lobe varies in different cases, and has sometimes been observed to become almost epidemic. From M. Grisolle's cases it would seem, that pneumonia of the apex is about two and a half times as frequent on the right side as on the left; and he estimates the proportion of cases at all ages in which the right lung is affected, compared with those in which the left is diseased, to be as 11 to 6.

Pneumonia is often associated with bronchitis, so that the former may be masked by the latter. This is especially the case in children, in whom no information from the sputa is attainable: at the same time, the sounds afforded by percussion may be alike on both sides, as the affection is rarely confined to one lung. Previous to six years of age, the symptoms and progress of the disease differ somewhat from those of a later period; it would seem then, according to Messrs. Gerhard, of Philadelphia, Rufz, and Rilliet and Barthez, to occur mostly as a secondary lesion, and it has been conceived to be owing to a stagnation of blood in the lungs, which acts, as it were, as a foreign body, and concurs in producing an alteration in the pulmonary tissue, with which it combines and becomes identified, so as to form what is called *hepatization of the lungs*. Although, however, in very young children, the disease is generally secondary, in other cases it attacks those in perfect health, and runs its course in a brief space of time, sometimes in forty-eight hours. Howsoever this may be, it is certain, that in children the diagnosis between pneumonia and bronchitis is not easy.

Diagnosis.—The essential symptoms of pneumonia are—febrile excitement, cough, viscid, bloody or purulent expectoration, and shortness and difficulty of breathing; yet these are not pathognomonic; and it is only by associating them with the physical signs, and carefully observing the latter, that we are enabled to pronounce positively; for although, as has been well remarked by Dr. Stokes, any of the physical signs taken singly may occur in other affections, in pneumonia their mode of succession is characteristic; still, the diagnosis is not as easy as some have imagined: this is exhibited by the fact, that the respectable pathologist just cited, as well as Drs. Bright and Addison, consider pungent heat of the surface as the most invariable and conclusive diagnostic, and that where inflammation is confined to the chest, howsoever various may be the tissues implicated, the presence of this symptom may be esteemed a certain indication of pneumonia in nineteen cases out of twenty. It certainly, as the author's experi-

ence has amply testified, is a most important functional aberration in the disease.

As regards the symptoms that are referable to the lungs themselves,—one of the most important is the expectoration. Cough is perhaps always present, and almost always supervenes in the first twelve hours of the disease, according to M. Grisolle, in 80 cases in 90. It is rarely paroxysmal as in bronchitis. At the commencement of the inflammation, the cough is dry, and by no means in a ratio with the extent of the inflammation. If some degree of bronchitis have preceded the attack of pneumonia, which, according to M. Grisolle, in those between 16 and 70 years of age occurs in a quarter of the cases, the sputa may be mucous; about the second or third day of the disease, however, the matter of expectoration becomes characteristic, consisting of mucus intimately mixed with blood; yet this appearance is by no means constant. The disease may, indeed, occur without any characteristic, or indeed without any, expectoration; and as has been observed by Messrs. Andral and Stokes, where the bloody and viscid sputa are present, their appearance may vary from yellow, or rusty, to florid red in the course of the same day. As the disease proceeds, the density of the sputa augments, and they become viscid, transparent, and so tenacious as to adhere to the sides of the vessel. In this state, they may remain until the disease is about to terminate, when they vary according to the nature of such termination. If it be about to end by resolution, they lose their red colour and great viscidity, but resume them on the occasion of any exacerbation; on the other hand, if it grow very serious, they become small in quantity, are expectorated with difficulty, and, at times, wholly suppressed. This suppression may be real, or the sputa, owing to their viscidity and the feebleness of the patient, may accumulate in the bronchial tubes, and induce death by asphyxia.

Although the rusty sputa—*crachats rouillés*, of the French pathologists—are found in the more active cases in persons of robust habit, yet in a large proportion of hospital cases, in which the disease occurs in feeble constitutions, in the child, and as a sequel to fever, the appearance of the sputa has been esteemed of little value. It is certain, that there are many cases, which run their course both to a happy and fatal termination, in which the matter of expectoration is similar to that of simple bronchitis. In very young infants the expectoration is wholly wanting; yet many observers—amongst whom must be included the author—have noticed a whitish, slightly bloody, thick, and viscid froth issue from the mouth in such cases. In *intercurrent pneumonia*, or such as occurs in the course of another disease, the absence of the characteristic expectoration, according to M. Andral, is noticed. When the pneumonia has terminated in suppuration, the expectoration presents itself in two forms:—either in that of pus, or of a purplish-red muco-puriform fluid, having the consistence of gum-water, and the appearance of liquorice or prune juice,—the latter form of expectoration, occurring generally when the pneumonia is of a lower grade, and in broken-down constitutions; whilst the former is a consequence of active pneumonia in a healthy individual.

All the varieties of sputa seem to be caused by admixture of blood in different quantities, and to its more or less intimate union with mucus. M. Grisolle regards the sputa, which have a rusty, apricot-yellow or saffron, barley sugar, and greenish tint, and probably also those of a prune juice or liquorice juice colour to be characteristic of pneumonia. He does not attach the same value to those of brick-like hue, and to those that have the appearance of a strong solution of gum Arabic, inasmuch as he has met with the former in pulmonary apoplexy, and the latter in certain cases of acute bronchitis. Still, as they are much more common in pneumonia,—where they are present, we ought to suspect the existence of that affection. Of late, M. Remak has drawn attention to ramifying bronchial coagula, which are seen in the sputa, in the majority of cases, between the third and seventh day of the disease. In examining the sputa to detect these, the difference between the white mucus-fibrils and the bronchial coagula may be easily discerned, he affirms, without the aid of the microscope, by spreading them on a glass plate, when the former can be readily drawn out with a needle in the form of a delicate membrane, whilst the latter, from their firmness, resist the attempt, and are, moreover, rendered sufficiently conspicuous by their constant ramifications. The appearance of the delicate coagula imbedded in viscid mucus, M. Remak says, is generally simultaneous with that condition of the lungs in which the crepitation is most marked, whilst at the same time the sound evolved on percussion indicates that the substance of the lung is partially impervious to air. The firmer coagula usually occur at the period when the crepitation has given place to bronchial respiration, and the dulness on percussion indicates the existence of hepatization.

A result of some importance appears to be deducible from M. Remak's observations,—that the earlier the expectoration of the coagula commences, and the more copious and continuous it is, the more certain and speedy will be the cure. In the ordinary course of pneumonia, in vigorous persons, the delicate coagula appear in the first viscid mucus that is expectorated, and continue increasing in quantity and size until the fifth day of the disease, decreasing gradually from that period, until white, easily compressible masses of a cylindrical but non-ramifying form appear in their place, exhibiting under the microscope indications of the fibrous structure of coagulated fibrin, and a multitude of granular mucus-corpuscles. In fifty cases of pneumonia, observed by M. Remak, there were not more than four or five in which even a partial diminution of the symptoms occurred previously to the appearance of the coagula in the expectoration, whilst in the great majority an amendment was first observed after their occurrence. Not the least trace of the coagula was observed by M. Remak in four cases of genuine bronchitis that fell under his observation. M. Schönlein regards the presence of the bronchial coagula in the expectoration of pneumonia as a certain evidence that exudation is going on; and an indication of the importance of antiphlogistic measures. In the third stage of the disease, the coagula are not visible. (*British and Foreign Medical Review* for April, 1847, p. 506.)

Dyspnœa is a symptom, which is present to a greater or less degree

in pneumonia, but to a less extent than in bronchitis or pleurisy: the extent of obstruction cannot certainly be estimated by the amount of difficulty of breathing. Occasionally, however, great oppression is experienced at the chest, with anxiety, lividity of face, and sense of suffocation. These cases not uncommonly terminate fatally. On the other hand, especially after antiphlogistic remedies have been used, the breathing is singularly easy, even although a large portion of the lung may be solidified.

Pain—it has been supposed—does not exist in pneumonia, unless the pleura is involved, which, however, as already remarked, is generally the case. The pain may be felt in various parts of the chest, and is most severe at the commencement.. In 161 of 182 cases, observed by M. Grisolle, it supervened in the first twelve hours, and scarcely ever after the fourth day. According to the numerical estimate of M. Grisolle, in 175 cases, it was seated at the nipple in 89 cases; at the base of the chest, about the 6th or 7th rib, in 39 cases; and in about one-fifth of the cases, the seat of the pain corresponded precisely with that of the pulmonic inflammation. It is usually augmented by coughing, inspiration, change of posture, percussion, and by lying on the affected side.

It is maintained by some pathologists, as by M. Valleix and Dr. Gerhard, that inflammation of the pleura rarely complicates the pneumonia of children. By others, however, the complication has been found to be common, the pleura having been unaffected, in the observations of MM. Rilliet and Barthez, in ten cases only. Evidences of acute pleurisy existed in one-third of the children from two to five years of age. Nor is it a common complication in old age, not having been marked by M. Grisolle in more than one-third of the cases. In the adult age, the pleura is almost always more or less inflamed, having been observed so, according to M. Grisolle, in 33 out of 35 cases.

When the pleura is unaffected, a feeling of constraint, a kind of weight and sensation of heat, is experienced in the chest.

It has been often said, that patients constantly lie on the side affected, but such is certainly not the fact; the decubitus is generally, indeed, on the back.

Three stages of pneumonia were pointed out by Laënnec. In the *first*, the lung is engorged with blood, and a crepitating rhonchus is heard; in the *second*, solidification takes place, with its physical signs; and in the *third*, interstitial suppuration of the lung, or the condition, which precedes the formation of abscess, supervenes. It has been suggested, however, that a stage prior to the first of Laënnec, exists, and, consequently, that Laënnec's first is really the second stage of the disease; and there can be no doubt, we think, that a stage of irritation, if not of inflammation, exists, previous to the secretion or effusion, which causes the crepitant rhonchus. Dr. Stokes affirms, that he has repeatedly seen a condition of the lung, which seems to be the first stage, and in which the pulmonary tissue is drier than usual, not at all engorged as in Laënnec's first stage, and of a bright vermilion colour, from intense arterial injection. This condition was found in the upper portions of lungs, in the middle and lower parts of which

Laënnec's first and second stages existed. Dr. Stokes, consequently, enumerates the stages of pneumonia as follows:—*First.* The lung drier than natural, with intense arterial injection, no effusion of blood into the cells. *Second,* (*Laënnec's first.*) The cells engorged with blood; no change of structure. *Third,* (*Laënnec's second.*) Solidity and softening,—(*Ramollissement rouge,* of M. Andral.) *Fourth.* Interstitial suppuration. And *Fifth.* Abscess.

In the *first* of these stages, the principal phenomenon, according to Dr. Stokes, is local puerility of respiration, which may be esteemed diagnostic, if it occur along with fever and excitement of the respiratory system, especially if there be clearness of sound on percussion, indicating that no extensive organic modification has yet occurred. Nor does the sound on percussion become obscured, until about the second or third day, and sometimes later. M. Grisolle, on the other hand, is induced to think, that in the very early period of the disease the crepitation is preceded by feebleness of the respiratory murmur.

In the *second stage* of Stokes—the first or stage of *engouement* of Laënnec—the crepitating rhonchus is heard along with a gradually diminishing respiratory murmur. This crepitating rhonchus has been compared to the sound produced by rubbing a lock of hair close to the ear. It may be simulated by moistening the thumb and finger with very thick paste or mucilage of gum Arabic; and alternately pressing them together, and separating them when held near the ear. As a physical sign, it points out a secretion or effusion around the vesicles, but to determine that it is pneumonitic, the increasing dulness and gradual obliteration of the respiratory murmur must be combined with comparative dulness of sound on percussion. Different opinions have been held in regard to the production of this rhonchus; but the one embraced by Dr. Walshe, appears to be the most probable,—that its physical cause is the sudden and forcible expansion of the pulmonary parenchyma, glued together, as it were, by the viscid exudation with which it is infiltrated. "Each single crepitus or click would thus signify the expansion of a cell, and be produced by the unfolding of surrounding glutinous tissue necessary for that expansion."

It may be proper to remark, that in some cases the crepitant is united with the mucous rhonchus. In other cases, a crepitant rhonchus has been heard, where there was simple bronchitis without any inflammation, perhaps, of the pulmonary parenchyma; [!] and hence it has been inferred, that, like other rhonchi, the crepitant rhonchus results from a mixture of air and liquid, and that the differences, which the rhonchi present, are owing to the difference in the size of the cavities in which they are produced. In cases, for example, of extensive excavations in the lungs, *gargouillement* or gurgling is heard; in the larger bronchia, the mucous rhonchus; in the bronchia of medium size, a mixture of the mucous and crepitant rhonchi; and in the smallest bronchia and pulmonary vesicles, the pure crepitant rhonchus. These different rhonchi M. Andral designates respectively—the *cavernous,* the *bronchial,* and the *vesicular.*

In the *third stage* of Dr. Stokes—the second of Laënnec—there is solidity with softening; the cells are obliterated, whilst the large tubes

remain pervious: there is, therefore, dulness of sound, with bronchial or tubal respiration, a loud resonance of the voice—*bronchophony*—and an increase of the vocal fremitus,—signs which sufficiently indicate solidification. The bronchial respiration is almost always perceived first during expiration, and, according to M. Grisolle, it is not until the hepatization is more complete, that the phenomenon exists, becomes predominant, and often even only marked during inspiration. In proportion as the lung becomes more completely impermeable to air, the crepitation is less and less; and it ultimately ceases when the tubal respiration becomes rude. The transition from the crepitant rhonchus to the bronchial respiration, instead of being direct and rapid, is occasionally accomplished more slowly and by the aid of an intermediate phenomenon, which M. Grisolle has termed *bruit de taffetas*, or 'sarcenet sound,' which consists of a rude, dry sound, heard during inspiration, and especially when the patient coughs, and similar to that produced by tearing a piece of sarcenet, or rumpling a robe of silk. This sound, which is heard especially in the axilla, at the anterior margin of the lung, and at the inner part of the scapular fossa, is characteristic, according to M. Grisolle, of hepatization occupying only the surface or *cortex* of the lung. When the lesion is deeper seated, the *bruit de taffetas* is more intense, ruder, and is ultimately replaced by the bronchial respiration. In children and in cases in which the feebleness of the patient's voice might not permit bronchophony to be heard, a greater resonance of the observer's own voice (*retentissement autophonique*), may be heard, when he speaks with his ear applied accurately to the chest opposite the seat of hepatization. Of this auscultatory sign mention has been made already (p. 234).

In children, the subcrepitant rhonchus is a sign of great moment in pneumonia. It was present in 42 out of 51 cases observed by Dr. West. In 22 cases, the true crepitant rhonchus was heard, which in 14 cases was preceded by the subcrepitant, or associated with it. MM. Rilliet and Barthez accord as to the existence of the crepitant rhonchus in children; yet Messrs. Gerhard and Rufz, deny that it is met with in those between two and five years of age. It need scarcely be said, that the positive testimony is of more importance than the negative. These rhonchi are of shorter duration, less regular in their progress, and undergo more changes than in the adult. They readily disappear if the patient be kept seated for a short time, and, according to MM. Rilliet and Barthez, their greatest distinctness is when the child is raised from the bed.

Occasionally, rapid solidification occurs without being preceded by the usual signs—the lung passing, in the course of a few hours, from apparent health, according to every physical sign, to solidification. Signs of sudden solidification, without preceding crepitating rhonchus, have been regarded pathognomonic of pleurisy with effusion, yet they are equally indicative of the condition just described. The principal physical diagnosis between this '*typhoid solidity*' and a pleural effusion, as remarked by Dr. Stokes, is, that with the dulness and absence of respiration of a considerable effusion, the signs of eccentric dis-

placement are wanting; the heart is *in situ*: the epigastrium and hypochondria are concave, and the intercostal muscles unaffected.

When pneumonia is about to end by resolution, and to pass from the third stage to the second, the crepitating rhonchus returns. This has been called the *returning crepitating râle—Rhonchus crepitans redux, Räle crepitant de retour:* the tubal respiration diminishes; the bronchophony gradually disappears; the crepitating rhonchus fades away, by little and little, until, ultimately, only the normal sound of respiration can be heard. In many parts of the lungs, however, different physical signs may be elicited, indicating that these parts are in different stages of inflammation; and, at times, after the other signs have ceased, a crepitant rhonchus may remain. This circumstance should keep the physician on his guard against a relapse, or some disorganization of the lung, which may result insidiously from the existing phlegmasia. It was the opinion of Laënnec, that as solidification of the lung disappears, the fact is invariably announced by a return of the crepitating rhonchus; but this would not appear to be an absolute rule: the change, indeed, from complete dulness of sound, and tubal respiration, to clearness and return of respiratory murmur, has been often observed by Dr. Stokes, without any *crepitus of resolution*.

The signs of the *fourth* and *fifth stages* of Stokes are the following:—If there be tubal respiration, along with a sharp and peculiar mucopurulent rhonchus, these signs, taken along with the previous history of the disease, and the existing symptoms, will lead to the inference that there is interstitial suppuration.

The signs of pneumonitic abscess do not differ from those of tuberculous cavities; the former are generally, however, at the inferior portion, or about the root of the lung, and are not so slow in their formation as the latter.

If pneumonia be deeply seated towards the base, the centre, or the root of the lung, percussion may yield but little information, and the same remark applies to auscultation. In like manner, when an isolated lobule is inflamed, the physical signs may yield no information as to the existing lesion. When inflammation affects both the lungs and pleura—*pleuro-pneumonia*—the signs of pneumonia may be modified by those of solid, fluid, or aeriform secretions into the pleura: notwithstanding, however, the frequency of adhesions, the friction sound—*bruit de frottement*—is rarely observed in pneumonia. The secretion of air into the pleura is indicated by the sudden appearance of tympanitic resonance over the affected portion of the lungs, which may be distinguished from the *cracked vessel sound—bruit de pot fêlé*—of caverns, and, as remarked by Dr. Stokes, differs, also, from the clear sound rendered by percussing the lower portions of the lungs over the stomach distended with air. Lastly, during pneumonia, a bellows sound—*bruit de soufflet*—of the heart has been observed; and also, during the earlier stage of the disease, a throbbing over a large portion of the chest, synchronous with the systole of the heart. The bellows sound has been supposed by Doctors Graves and Stokes to be owing to inflammation, either of the pericardium or endocardium, accompanying the pneumonia; and the throbbing has been presumed to

be owing to the semi-fluid condition of the lungs, the pulsations of the heart being propagated through those organs, and occasioning phenomena analogous to those of aneurism.

The average duration of pneumonia is from twelve to twenty-four days. At times, it continues only two or three days; at others it may go on for thirty or forty. It is always a serious disease. Of seventy-eight cases, observed at La Charité between the years 1821 and 1827, twenty-eight, according to M. Louis, proved fatal. When intercurrent, it is almost always fatal; and prior to the ages of 5 or 6 years but few recover. The latter circumstance is both owing to the age, and to the disease being at this period of life generally consecutive on some other morbid condition. The pregnant state is likewise an element of unfavourable prognosis: of 15 trustworthy cases recorded in the books, and cited by MM. Grisolle and Wunderlich, eight miscarried or were delivered; and of these only two of the delivered and one of the miscarried, who were affected with moderate pneumonia, recovered. The other five as well as the remaining seven died;—that is, the mortality was 12 in 15 cases. The disease is also very fatal to the insane and paralytic, with whom it frequently supervenes in a latent manner. It would seem, however, that in cases even of confirmed phthisis recoveries from coincident pneumonia are by no means unfrequent.

Acute pneumonia may, likewise, pass into the chronic form, or it may give occasion to the formation or developement of pulmonary tubercles: but this rarely happens.

Many varieties are observed in the disease. For example,—intense pneumonia may exist, without giving rise to dyspnœa, cough, or the characteristic sputa; and it would appear, that auscultation may afford no sign of it. It is, however, in such cases that physical diagnosis is all-important. In this form, the disease has been termed *latent pneumonia*. M. Saucerotte has seen it apparently allied to a certain epidemic constitution; when it did not present the ordinary symptoms of pneumonia; but began, as it were, with the phenomena that indicate the stage of hepatization. It is rarely primary, and commonly supervenes in the course of other diseases. Of the differences presented by pneumonia, when it occurs in children, we have already spoken. In them, the disease frequently terminates fatally, before it reaches the third stage; the appearances on dissection being principally those of engorgement of the lungs.

In old persons, a more rapid prostration is induced than in adults, and hence the term *Peripneumonia* seu *Pneumonia notha*, which has been applied to the disease in them, as well as to chronic bronchitis; which latter affection is indeed very apt to be complicated with pneumonia, giving occasion to intense dyspnœa.

It has been properly remarked by M. Andral, that great practical difficulty exists in diagnosticating the symptoms of pneumonia, when it occurs in the course of serious fevers, pleurisies, pericarditis, arachnitis, gastro-enteritis, pulmonary tubercles, aneurism of the heart, &c.

Of the catenation of symptoms, which constitute the bilious and typhoid forms of pneumonia, special mention will be made hereafter.

Pneumonia and acute rheumatism are diseases in which the increase in the proportion of the fibrin of the blood has been found greatest. In 84 bleedings, practised by M. Andral, in the course of well-marked pneumonia, there were only 7 in which the proportion oscillated between 4 and 5 in the 1000; in the 77 others, it exceeded this; maintaining itself in eleven cases between 5 and 6; in nineteen, between 6 and 7; in fifteen, between 7 and 8; in seventeen, between 8 and 9; in nine, between 9 and 10; and in six it rose as high as 10, and even exceeded this a little.

Numerous analyses by MM. Simon, Rindskopf, Becquerel and Rodier, &c., are referred to in the "Animal Chemistry" (Sydenham edition) of the first mentioned observer. In regard to the great amount of the fibrinous element, they accord with the observations of MM. Andral and Gavarret. The maxima, minima and average results obtained by these gentlemen have been tabulated as follows:—

	Water.	Solid residue.	Fibrin.	Corpuscles.	Solid residue of serum.
Maximum,	834·4	229·5	10·5	137·8	95·2
Minimum,	770·5	165·6	4·0	83·2	66·7
Average,	799·0	201·0	7·3	114·1	81·0

Heller states, that he has often been able to detect biliphæin in the blood of pneumonitic patients, when there has been no other indication of a disordered state of the functions of the liver.

The urine in pneumonia is subject to considerable variations, dependent upon the extent of the disease, and the degree of inflammation. In severe inflammation it is very dark, of high specific gravity, and frequently depositing sediments, especially "at critical periods, and during the fever." (*Simon.*) An appreciable amount of albumen in it is by no means uncommon. During the whole period of inflammation it remains acid, and M. Becquerel found this to be the case during the period of convalescence also. The mucus is increased in quantity during the febrile period, and this is observable in a more marked degree in women than in men. M. Simon made two analyses of the urine in pneumonia. *Analysis* 1 is of the urine of a man aged 35 years: it was of a fiery red colour, clear, and strongly acid; the pulse full, and 108 in the minute. *Analysis* 2 is of the urine of a man aged 40: it was of a dark yellow colour, had an acid reaction, and contained a considerable quantity of mucus. In both cases, there was a good deal of albumen.

		Analysis 1.	Analysis 2.
Specific gravity,		1017·0	1020·0
Water,		959·60	947·90
Solid residue,		40·40	52·10
Urea,		15·79	19·35
Uric acid,		0·71	1·50
Alcohol extract, with lactic acid and ammonia-salts,		9·34	9·65
Spirit extract,		1·10	3·18
Water extract,		5·84	6·40
Albumen,		1·47	0·50
Earthy phosphates,		0·42	0·56
Sulphate of potassa,	3·70		
Phosphate of soda, chloride of sodium, and carbonate of soda,	3·28	6·98	6·74

From these analyses it appears, that in the urine of pneumonia the urea is a little diminished; the uric acid increased; the salts are diminished, and the extractive matters, especially the alcohol extract, increased.

According to M. Schönlein the "crisis" in pneumonia shows itself in the urine by its becoming turbid and sedimentary. After ten or twelve hours, a crystalline micaceous deposit forms, above which the urine becomes clear. M. Martin Solon states, that in twenty-four cases of pleuropneumonia he found albumen in the urine in twenty-two. "It was especially observed at the period of the crisis."

Pneumonia is not unfrequently complicated with other pulmonary diseases—as bronchitis, and pleurisy and phthisis, and with diseases of the heart,—as pericarditis and endocarditis: but still more frequently, according to M. Bouillaud, which the author has had an opportunity of confirming, with the formation of fibrinous clots in the cavity of the heart. According to M. Grisolle, pneumonia accompanies jaundice in about one-thirteenth part of the cases. Delirium is a more common complication, for it occurs in between one-eighth and one-eleventh of the cases. M. Grisolle has observed it more frequently in the male than in the female, and in persons above forty years of age.

Causes.—Pneumonia is a disease of all climates, although, like other inflammatory diseases, less frequent perhaps in Australia. It would seem to be not so common where the climate is warm and equable; and, in temperate regions, some countries are more affected by it than others. In the United States, it is very common; and, according to the statistics that have been taken, it is here, also, more frequent in some places than in others. The following table, prepared by an accurate medical statistician, Dr. Emerson, of Philadelphia, exhibits this fact as regards some of the principal cities of the United States. It gives the average mortality from consumption, and acute diseases of the lungs in those places.

	New York.	Boston.	Philada.	Baltimore.
Average annual proportion of the general mortality to the population, one in	39·36	44·93	47·66	39·17
Average of the mortality from consumption alone, to the general mortality, one in . .	5·23	5·54	6·35	6·21
Average of consumption and acute diseases of the lungs, one in	4·07	4·47	4·90	5·33

It would appear, that situations in cold and variable climates, in which the hygrometric state of the atmosphere varies considerably, and which are open to cold winds from the ocean, are less fitted for those who are liable to inflammatory affections of the pulmonary organs. (*Human Health*, p. 173, Philad. 1844.)

The attention of the army medical officers of the United States has been drawn to this subject; and the following table, published by Dr. Forry, of New York, presents, in a condensed shape, so far as regards the catarrhal form of pulmonary lesions, the result of the quarterly sick reports of 45 permanent posts, arranged in classes, and comprising a period of ten years, and of 31 temporary posts in Florida. It is based on an aggregate mean strength of 47,220 men, and the

period of observation extended from 1829 to 1838 inclusive. It exhibits the condensation of about 1500 quarterly reports of sick, and the mean strength of each post, computed from monthly returns in the Adjutant-General's office.

Ratio of Catarrhal Diseases.

Divisions.	SYSTEMS OF CLIMATE.	Latitude.	Difference between the mean of winter and summer.	Ratio treated per 1000 mean strength.				
				First quarter.	Second quarter.	Third quarter.	Fourth quarter.	Annual result.
Northern.	1st class. Posts on the coast of New England.	43° 18′	38° 61	63	49	36	85	233
	2d class. Posts on northern chain of Lakes.	46° 27′	43° 00	90	62	50	96	300
	3d class. Posts north of lat. 39°, and remote from the ocean and inland seas.	44° 53′	55° 84	175	120	86	169	552
Middle.	1st class. From Delaware Bay to Savannah.	37° 02′	32° 99	102	45	23	97	271
	2d class. Southwestern stations.	35° 47′	36° 83	122	61	33	78	290
Southern.	1st class. Posts on lower Mississippi.	30° 10′	24° 39	92	34	26	60	218
	2d class. Posts in Peninsula of East Florida.	24° 33′	11° 34	45	24	40	33	143
	Total,			689	395	294	618	

We require further information, however, in regard to local and atmospheric influences in general in the production of pneumonia. Parent du Chatelet affirms, that a residence in damp cellars does not appear to predispose to it in a higher degree: and Mr. Farr affirms, that it is more common in the large cities of England,—London, Manchester, Birmingham and Leeds,—than elsewhere. It is certainly, however, more likely to occur in cold and moist seasons, and therefore, it may be presumed, in cold and moist localities.

In the French hospitals, three times as many cases of pneumonia have been observed in the first six months of the year as in the last, and such was nearly the proportion in the Philadelphia Hospital, during the years 1840, 1841, and 1842; 39 cases being received in the first six months, 12 in the last. Its maximum frequency in Paris, according to M. Grisolle, is in the months of March and April; and Dr. Tabb, of Gloucester County, Va., in his Statistics of Deaths in the Philadelphia Hospital, Blockley, states, that the disease occurred there more frequently in April than in any other month; but was more fatal in December and January. M. Chomel affirms, that in his wards at La Charité, in Paris, according to statistics carefully collected by M. Louis, of 97 cases of pneumonia 81 occurred from February to August inclusive, and only 16 in the other five months of the year.

According to the report of the Registrar-General of England, for 1841, it appears that the deaths from pneumonia were to the deaths from all causes, in persons under fifteen, in the following ratio:—in

the first three months of the year, 15·3 per cent.; in the second, 11·4; in the third, 8·9; and in the fourth, 18·7. This ratio, applicable to cases of pneumonia in general, appears to correspond with that observed by Dr. Charles West, of London, in children. Of 2450 cases of disease occurring at the Infirmary for Children, in 1841 and 1842, taking the mean of the two years, the ratio of cases of pneumonia in the first three months was 5·1 per cent.; in the second three months, 2·5; in the third, 3·8; and in the fourth, 5·8.

Often pneumonia is ascribed to the influence of sudden chill whilst in a heated state; but on an accurate scrutiny of 205 cases, M. Grisolle found, that only 49 were preceded by sudden chill; and if we take the average of these observations, along with those of MM. Chomel and Barth, it would show, that of 409 observed cases, 91 only were preceded by sudden chill. This would not, however, seem to be the case everywhere.

It has been already remarked, that pneumonia often occurs in the course of other diseases: it would seem, indeed, that chronic inflammation in any organ has a tendency to predispose to it; so that, after a chronic disease has persisted for a long time, the patient may be carried off by an attack of acute pneumonia. In children from the age of two to sixteen there would appear to be six diseases, in the course of which pneumonia is apt to occur in very large proportion. Thus, according to M. Grisolle, secondary pneumonia occurs in $\frac{7}{8}$ of all cases of croup: in $\frac{5}{6}$ of all cases of cancrum oris: in $\frac{1}{3}$ of all cases of enteritis, measles, and hooping-cough; and in $\frac{1}{4}$ of all cases of small-pox. According to the same observer, intercurrent pneumonia was seen in $\frac{1}{7}$ of all cases of continued fever; $\frac{1}{6}$ of cases of acute affection of the brain; $\frac{1}{4}$ of cases of pulmonary tubercles; $\frac{1}{4}$ of cases of disease of the heart; and in about $\frac{1}{6}$ or $\frac{1}{7}$ of all cases of cancerous disease of the viscera; organic diseases of the liver,—especially cirrhosis, Bright's disease, &c. It is likewise a frequent complication of glanders, and phlebitis, and hence it is apt to occur in connexion with, or as a consequence of, surgical operations and injuries. From a table of forty-one deaths, following various injuries and diseases in the surgical wards of University College Hospital, London, in which an account of the state of the lungs was kept, these viscera, according to Mr. J. E. Erichsen, were found in twenty-three cases to be in the first or second stage of pneumonia. On this account, it has been suggested to defer operations during very severe weather, or during the prevalence of an epidemic pneumonia. It is maintained by M. Grisolle, that every morbid condition of the economy, in which there is a febrile movement, and a great degree of debility, predisposes to pneumonia; and the tendency is strongly marked in the diseases of infants and the aged. Thus, in the former, secondary pneumonia, which is observed almost only in the first five or six years of existence, is especially common in gangrene of the mouth, measles, hooping-cough, croup, small-pox, typhoid fever, and chronic enteritis; and he agrees with M. Piorry, who appears to have first made the observation, that a prolonged horizontal position on the back ultimately induces, in the lowest

or posterior portions of the lungs, a sanguineous congestion, which is the cause of a considerable number of cases of consecutive pneumonia.

Of 136 cases of acute rheumatism, observed by Dr. Latham, pneumonia existed in 18, or in about 1 case in $7\frac{2}{3}$.

The great dyspnœa, which precedes dissolution in most cases, has been regarded as pneumonia, and has received the epithets *Pneumonie des agonisants*, and *Hypostatic pneumonia*, but there is little reason for the opinion, that the condition is inflammation. It appears rather to be a state of hyperæmia, dependent upon the difficult transmission of blood through the lungs.

Pneumonia occurs at all ages. It has been found even in the still-born, and is, consequently, an intra-uterine disease also. It may be mistaken, however, for *atelectasis* of the lung or imperfect expansion of the air-cells at birth,—the unexpanded portion being in a state of *carnification*, as it has been termed. The report of the Registrar-General already referred to, shows, that of 1553 deaths from pneumonia, occurring in three large towns of England, 1348, or 86·7 per cent., were in persons under 15; of these 1348, 1093, or 81 per cent., were children under 10 years of age; and 1231, or 91·3 per cent., under three. Similar results were obtained in regard to the pneumonia of childhood by Dr. Charles West. Statistical investigation has shown, that it proves fatal in an increasing proportion after the 20th year, infancy being excepted. M. Chomel found the mortality of persons before twenty, 1 in 30; but between twenty and forty, it rose to 1 in 8; and between forty and sixty to 1 in 5. M. Grisolle likewise found the mortality between fifty and sixty to be 1 in 5. It attacks both sexes, but men more frequently than women, in the ratio—it has been estimated—of 2 or 3 to 1. This is doubtless owing to their greater exposure to its exciting causes, for, according to M. Grisolle, when field and other open air labour is shared equally by both sexes, the proportion is the same. This accords with the observation of M. Ruef, who found in a wine district, in which both sexes laboured equally, the ratio to be nearly equal—44 males to 50 females; and the same results were obtained by M. Munaret amongst the mountain inhabitants of Asia; and by Talmouche in the poorhouse at Rennes. In infancy, too, females suffer as much as males. Of 108 cases, observed by M. Hache, 50 occurred in boys; 58 in girls. Of 129 cases recorded by MM. Valleix and Vernois, 67 were boys, 62 girls. It is proper to remark, however, that the results of statistical inquiries on this matter differ. Of 245 cases noticed by MM. Rilliet and Barthez, 150 occurred in boys, and 95 in girls. In 118 observed by Dr. West, 65 were in boys and 53 in girls; and in 104 cases of which an accurate account was kept by Dr. Condie, 60 occurred in boys, and 44 in girls. In Philadelphia, in the ten years preceding 1845, of 1615 deaths from pneumonia, 872 were of boys, and 743 of girls. It would seem, that females are much less favourable subjects for pneumonia than males; the mortality of the former being, in M. Grisolle's experience, from one-third to one-half greater. At times, it appears epidemically, when its characters may be so far modified as to demand a very different treatment at one time from that which is required at another.

Pathological Characters.—In accordance with the different stages, of

engorgement of the lung, solidification, and interstitial absorption, laid down by him, Laënnec adopts three degrees in which the pulmonary parenchyma may be found affected on dissection. 1. *Simple engorgement.* 2. *Red hepatization;* and 3. *Gray hepatization.* The word *hepatization* has, however, been objected to, as not expressive of the changes that are induced either in the second or third stages of Laënnec. It has been observed, that an inflamed lung differs from liver in consistence especially,—being most commonly softened and friable; but, at the same time, in certain, and much more rare, cases it is harder than natural. On these accounts, M. Andral proposed, that the terms *red* and *gray ramollissement* should be substituted for the *red* and *gray hepatization*, of Laënnec. M. Andral's own observations, however, show, that the term *ramollissement*, which signifies *mollescence* or *softening*, can only apply to a portion of the cases, and, accordingly, the word *solidification* is usually given by pathologists to any condition of the lungs, in which their vesicular structure becomes filled with a secretion, that prevents the reception of air into them.

If a patient die in the early stages of pneumonia, when the lung is simply engorged, the crepitation of the lung may still exist, but it will be more feeble than in the natural state, and pressure will show, that the pulmonary vesicles contain fluid as well as air. The parts, which are affected with inflammation, are of a brown or vermilion colour, which contrasts with the appearance of the healthy lung. When the affected part is cut into, a frothy and bloody fluid exudes, and if the engorged parts be well washed, their colour is restored as well as their crepitation, and they float high in water. If the inflammation be more intense than this, the consistence of the parenchyma of the lungs is diminished; it becomes friable, and breaks down readily when pressed between the fingers. In this state, it resembles the tissue of the spleen, and the condition of the lung has accordingly been termed, by some, *splenization*, and also, *sanguineous infiltration;* Fr. *Engouement;* Ger. *Anschoppung.* When cut into, the fluid that exudes is less copious and frothy; and this condition has been esteemed the transition from engorgement to solidification. The friability of the lungs, when pressed upon with the finger, has very generally been regarded as the distinctive character of the inflammatory congestion, by which it may be distinguished from the cadaveric congestion referred to under Hyperæmia of the Lungs. The author has, however, long taught the impossibility, in many cases, of distinguishing, from the appearances after death, the two states from each other; and M. Grisolle has arrived at a similar conclusion. He properly remarks, however, that the inflammatory congestion almost always coincides with one or more of the lesions that characterize the second and third stages. By some, indeed, splenization is considered to belong to the second stage.

In the second stage of Laënnec, *Red Hepatization* or *softening;* Fr. *Hepatisation rouge, Ramollissement rouge;* Ger. *Rothe, braune Hepatisation, Rothe Erweichung*—the third stage of Dr. Stokes—the pulmonary vesicles become impervious to air; the lung is of a lightish brown-red colour, and resembles the liver in appearance: it is no longer crepitant, and when the solidified portion is thrown into water it sinks. A

late pathological writer, indeed, Professor Gross, of Cincinnati, affirms, that although he has frequently tried the experiment, he has never witnessed this last circumstance, and he feels inclined, therefore, to regard it rather as an exception, than as a general event. The observation of the author does not accord with his; and the difference may have originated in the circumstance, that the portions of lungs, with which Dr. Gross experimented, may not have been wholly solidified, but may have contained sufficient air to render them buoyant. It is clear, indeed, that the substance of the lungs themselves, and the fibrinous fluid that gives rise to the solidification, must be heavier than water, and, therefore, unless buoyed up by air, that they must inevitably sink. The weight of the healthy lung is about 235 grammes, or nearly 7½ ounces. M. Grisolle has found the organ in the state of red hepatization to weigh 2500 grammes,—considerably more thna ten times the natural amount.

If the lung be cut into, a red, but not frothy, fluid exudes, less in quantity than in the preceding stages, and the pulmonary tissue appears to be composed of a multitude of red granulations of very small size, which are pressed against each other; white spots are likewise observed, which are caused by the pulmonary vessels and bronchial tubes that remain unaltered. Of the real lung nothing may be observable except the larger vessels and tubes—all the rest forming one homogeneous mass. In this stage, the pulmonary tissue is so much softened, that it can be crushed readily under the finger, and reduced into a reddish pulp; hence, the name *Ramollissement rouge*, which was given to it. The weight and size of the lung are manifestly augmented; accordingly, it presses against the ribs, which cause indentations in it; but this cannot happen, unless the increase of size is considerable.

If the inflammation of the lung has proceeded still farther, interstitial suppuration is established, constituting the *Gray hepatization* or *softening;* Fr. *Hepatisation grise, Ramollissement grise;* Ger. *Graue Hepatisation, Graue Erweichung.* The colour of the affected portion of the pulmonary tissue is now grayish; and, on making an incision into it, a grayish purulent fluid exudes, which may exist in the lung either in the state of infiltration or of abscess: in the former case, the granular appearance of the lung may be very marked; and the pus may be readily pressed out, if the parenchyma has been cut or torn. The substance of the lung is, in such cases, so friable, that if the finger be pressed lightly on any point, small cavities filled with pus may be made, which may be readily taken for recently formed abscesses. Occasionally, the pus may be traced into the small divisions of the pulmonary artery. The formation of pus commonly takes place from the twelfth to the fifteenth day, but cases have occurred in which it has been found as early as the fourth day. The formation of abscesses in the lungs is uncommon, the pulmonary texture not being favourable to them. On this point all observers agree. Of several hundred examinations, made of persons who had died of pneumonitis, in not more than five or six, according to Laënnec, was the pus collected into an abscess. On the other hand, tubercular cavities are very common,

and, doubtless, have often been enumerated amongst abscesses following inflammation of the pulmonary parenchyma. M. Andral met with but four cases; M. Gendrin with two; and MM. Hourmann and Dechambre with two in 88 cases. One of these was of enormous size, occupying more than one-third of the lung. Dr. Graves has, however, expressed the opinion, that "real circumscribed abscess occurs more frequently in the pulmonary tissue than Laënnec allowed, or his followers seem to believe." He has published six cases of pulmonary abscess, which occurred in his own practice and in that of his friends, in which complete recovery took place, to show, that patients may recover contrary to the usual interpretation of the most significant and decisive stethoscopic symptoms; and, therefore, to warn practitioners from relying too exclusively upon physical phenomena, and from concluding too hastily, that pulmonary lesions, however extensive, thus indicated, must necessarily prove fatal.

Of abscesses, perforating the lung from without, and of gangrene of the lungs, mention will be made under separate heads.

In children, lobular pneumonia is very common; and instead of its being confined to a single lobule, it often extends over many, constituting what has been termed *lobular pneumonia generalized.* As in the pneumonia of the adult, the morbid appearances may be divided into three stages. In the *first*, according to MM. Rilliet and Barthez, the cut surface of the lung is marbled with spots of a grayish rose and red colour; these spots are more or less circumscribed, and are more readily torn than the healthy tissue; but they float in water, yield liquid mixed with air, when pressed; and still crepitate. The *second* stage is the one most commonly met with, and resembles the hepatization of the adult: the *third*, or that of suppuration, requires careful examination to detect it—the substance of the lung having regained the grayish colour, which belongs to its healthy state; but, by careful attention, some lobules are observed more prominent than the rest; they are not flaccid like those around them, and, on pressure, they discharge a purulent fluid.

The appearances left by vesicular pneumonia may readily be confounded with the effects of phthisis. They have been accurately described by MM. Rilliet and Barthez. The lung is soft and flaccid, and is more or less collapsed according to the extent of the lesion. Its section presents a great number of granulations of a yellowish-gray colour, and of about the size of millet seed. These granulations differ in physical properties as well as in nature from crude miliary tubercles;—the former containing a liquid; the latter forming solid masses. If the former be divided, they collapse immediately, giving exit to a drop of puriform fluid. MM. Rilliet and Barthez propose the term *vesicular bronchitis*, which, they think, expresses the nature of the affection better than its usual name *vesicular pneumonia.* They consider the disease to be seated exclusively in the extreme bronchia—a certain number of pulmonary vesicles becoming inflamed, filled with pus, and dilated without the surrounding cellular tissue becoming implicated. It is not easy, however, to see how those minute tubes could be inflamed to suppuration

without the intervesicular cellular tissue being more or less concerned. This, indeed, is probably the mode in which lobular pneumonia is produced.

Treatment.—The importance of early and active treatment in pneumonia has been generally, if not universally, admitted. In such case, it can usually be controlled. It has, indeed, been esteemed the most manageable of all parenchymatous inflammations, when judicious treatment is adopted at an early period. Of the advantage of general blood-letting at an early stage, but little difference of opinion has existed. It is chiefly when the lung has passed to a state of solidification, that a question has arisen as to its advantage or appropriateness. The extent, to which the abstraction of blood should be carried, has, however, given rise to much diversity of opinion. Of late years, one observer—M. Bouillaud—has advised bleeding *coup sur coup*, and fixed the medium quantity necessary to be taken, at from 16 to 20 cups (*palettes*), of six ounces each, in three days; and he affirms, that of one hundred and two cases, ninety were cured, and only twelve died. The results of M. Bouillaud's plan of treatment were laid before the *Académie Royale de Médecine*, of Paris, by Professor Pelletan. Seventy-five cases were treated by repeated bleedings, the amount of blood taken varying from ten to seventeen *palettes*, which was drawn in the first three or four days after the patient's reception into the hospital. In pneumonia of one lung, only two cases in fifty-five terminated fatally. In double pneumonia, eleven cases of sixteen recovered. The average duration of the disease under this system was only from nine to thirteen days; whilst in fifty cases, treated by M. Louis less actively, the average duration was fifteen days. Almost all practitioners, however, agree, that this copious and repeated abstraction of blood is generally neither necessary nor advisable. The author has not found it often requisite to bleed more than twice or thrice at the farthest; and a recent and excellent pathological writer, Dr. Stokes, has affirmed, that of many hundred cases, he has had only one in which it was necessary to bleed oftener than twice, and in this instance, there was a complication with hypertrophy of the heart. The true principle seems—in his opinion—to be, that general bleeding is to be considered only as a preparative for other treatment, and not the chief means of removing the disease.

On the other hand, it has been maintained by M. Louis, from the results of numerical observations, that the influence of bleeding, when performed even within the two first days of pneumonia, is less than has been supposed, and that, in general, its power is very limited; that its effect, however, on the progress of the disease is found to be happy, and that patients, who were bled during the first four days, recovered—other things being equal—four or five days sooner than those bled at a later period. The researches of M. Louis gave occasion to numerical investigations, as to the effect of blood-letting in pneumonia, on this side of the Atlantic. Of thirty-one cases, treated at the Massachusetts general hospital,—in three, blood-letting was practised on the first day of the disease. The average duration was 13⅓ days. The number of bleedings, in each case, was four; and the average quantity of blood, abstracted in each, 61½ ounces. In fifteen

cases, which were bled, for the first time, on the first, second or third day, the average duration was 12⅓ days. The same thing was true, with a slight difference, of twenty-one cases in which bleeding was practised on or before the fourth day. In five cases, bled for the first time after the fourth day, the average period of convalescence was 13⅕ days. In these 26 cases, the average duration of the disease was 12½ days. In five cases, blood-letting was not employed, except in one, in which six leeches were applied. The mean duration of the disease was 14⅗ days. So far, consequently, as these cases go, it would seem, that the effect of bleeding, on or before the fourth day of pneumonia, is to shorten its course by nearly one day, when compared with the cases in which it was not employed till after that period:—compared with those who were not bled, it was shortened a little more than 2¼ days. These results, obtained by an accurate and careful observer—Professor James Jackson, of Boston—are confirmatory of those of M. Louis, which led him to infer, that bleeding does not exert so powerful an effect on pneumonia as is generally believed; but they are not sufficient to induce us to discard this important remedy, or to place as little reliance upon it as has been done by some. It is doubtful, whether it ever succeed in cutting the disease short: the remarks of M. Louis, indeed, on this point, are very explicit. His conclusion is,—"that we cannot cut short pneumonia by blood-letting, at least during the first days of the disease; and if the contrary has been believed to occur, it is, doubtless, owing to the disease having been confounded with others; or because, in some rare cases, the general symptoms rapidly diminish after the first bleeding; still, the local phenomena, crepitation, &c. for the most part, continue to advance with no less certainty." It must be admitted, however, from the testimony of most observers, that in strong and vigorous subjects, general bleeding is an important remedy; yet, it must be equally admitted, from the same testimony, that it ought not to be practised at all periods; and that after the stage of engorgement has passed into that of solidification, and *à fortiori*, when it has entered that of interstitial suppuration, it may be a very questionable agent. When the practitioner is called during the first stage of Dr. Stokes, or even during the second, a copious bleeding, which will exhibit its effects upon the system, or upon the morbid manifestations, but short of inducing syncope, may be sufficient. One single venesection of this kind, carried to the extent of relieving the pain in the chest, of permitting the patient to take a deep inspiration, and of converting the small, rapid and oppressed pulse, into one that is large and full—has been found more efficacious than four, practised at a later period. Of 180 cases, according to M. Most, it was found necessary in two only to repeat the blood-letting on the same day, or at the next exacerbation.

It is scarcely necessary to say, that circumspection should be used in regard to blood-letting, when, along with smallness and feebleness of pulse, a state of depression or exhaustion exists; or when the disease—as previously remarked—has passed beyond the first stage of solidification. In cases where doubt exists as to the repetition of blood-letting, the local abstraction of blood may still be very advisable. It

has, indeed, been considered, on the high authority of Dr. Stokes, as the principal remedy. The application of cups with the scarificator is preferable to leeches, but if the latter be employed, cups may be applied over them; and the abstraction of blood, in this way, may be repeated as the case may require.

Where bleeding alone has not proved successful, tartrate of antimony and potassa, given in large doses, has exerted a favourable action, and appeared to diminish the mortality. It is now, indeed, usually combined with general and local bleeding, and is commonly considered as secondary to them, not as a chief remedy, as it has been regarded by some. In order that the tartrate of antimony and potassa may produce its full effects on pneumonia, it is not necessary, or even desirable, that it shall induce vomiting or purging. Its contrastimulant powers are, indeed, best exhibited, when it produces no evacuation; or, in other words, when a tolerance is established. Where bloodletting cannot be practised, either owing to individual or epidemic influence, this remedy is, at times, extremely beneficial; or, if the patient be exhausted by age or other cause. or appear too weak to bear the loss of blood, or obstinately refuse to submit to it. It may, likewise, be a valuable agent, and of convenient employment in the country, where the physician can seldom make closely repeated visits. The signs, which promise success, are the tolerance or absence of evacuations, observable after the second or third dose,[a] with diminished frequency of pulse, and a feeling of improvement.

[a] R.—Antim. et potass. tartr. gr. vj.
Aquæ cinnam. f℥vj.
Acet. opii gtt. xij.—M.
Dose, half an ounce, every two hours.

It would seem, that as there are "medical constitutions," which do not admit of bloodletting, so there are some, so eminently phlogistic, that they interdict the use of tartarized antimony. For instance, after M. Bricheteau had employed it successfully in 1831, in the Hospital Necker, it could not be used advantageously at the end of 1832, and even at the commencement of 1833. If the dose of the tartarized antimony, as in the formula given above, be six grains the first day, the quantity may be increased by one or two grains daily, until ten, twelve, or fifteen grains are given in the twenty-four hours; but it is rarely necessary to exceed this quantity. Should the first doses produce vomiting, or purging, or both, these effects do not continue, but generally subside after the first twenty-four hours. As the disease yields, the remedy must not be suddenly discontinued. It is advisable to diminish the dose at the rate of a grain or two daily, until it is ultimately left off; but it should not be abandoned as long as the crepitant rhonchus is heard. It has been conceived by MM. Laënnec and Trousseau, that good effects have resulted from its use, even where a great part of the lung had been infiltrated with pus.

As tartarized antimony probably acts partly as a revellent, by the derivative influence which it exerts upon the lining membrane of the first passages, it will necessarily be contraindicated where gastritis is present. Where, however, it is inadmissible, another revellent may

be had recourse to with advantage, after bloodletting has been used as freely as has been deemed advisable:—mercury, for example, employed both internally and externally. The object is to induce a new action as speedily as possible. With this view, it is well, that the intervals between the doses should be considerable, as the system sooner feels the impression under such circumstances, than when it is given at short intervals.

R.—Hydrarg. chlorid. mit. gr. iv.
Confect. ros. gr. xij.—f. massa in pil. iv. dividenda.
Dose, one pill, every six hours.

Along with these pills, blistered surfaces, if such there be, may be dressed with strong mercurial ointment; and, as soon as evidences of the peculiar action of mercury on the system appear, the mercurial must be discontinued. It must be borne in mind, however, as has been more than once observed—that it is not easy to affect the system by mercurials, when the organic actions are greatly excited. It is necessary, therefore, to reduce these to the appropriate point first; and frequently, when mercury has been given freely, and without any sensible effects, a slight abstraction of blood will speedily develope them. The previous exhibition of tartarized antimony has been found to facilitate the mercurial action; and, moreover, both plans of treatment are by no means incompatible. Lately, the author has had under his care a severe case of typhoid pneumonia, which remained stationary for days, but ultimately yielded to a grain of calomel, given night and morning, and to a blister dressed with mercurial ointment, although none of the signs of mercurial action were induced.

Where solidification exists, after the ordinary signs of pneumonia have passed away, the cautious use of mercurials, with repeated local bleedings and revellents to the surface, afford the best prospect of success. The seton has often been employed, in such cases, with benefit, but it does not possess the advantage of counterirritation effected in an intermittent manner, as by successive blisters. Attention, it has been maintained, ought, in all cases, to be paid to position; the patient being directed to lie on the sound side to avoid hypostatic engorgement; or, where the posterior part of the lung is engorged, to lie on the face for a certain time every day. In the case of children, it has been esteemed important to place them in a semirecumbent position in the arms, or to prop them up in bed. In this manner, respiration is facilitated, as the diaphragm is not pressed upon by the viscera of the abdomen, and hypostatic engorgement in the posterior portions of the lung is less likely to occur.

With regard to blisters, much difference of sentiment has existed—as to whether they are advisable during the early stages, especially of acute pneumonia. Sinapisms to the inferior extremities are said to have been serviceable in some cases; but many advise, that blisters to the chest should be employed with caution,—affirming, that they are rather a torment than a relief. It is only after the febrile symptoms have been reduced, that much advantage can be expected from them. It has been affirmed, indeed, by M. Louis, that blisters have no evident action on the progress of pneumonia; and that without any

loss, they may be banished from the treatment of those cases of pleurisy and pericarditis, which occur in healthy subjects. The remark appears to be too sweeping; but there can be little doubt, that their employment is not indicated in the acute stage of the disease; and as little, that at a subsequent period, as well as in typhoid pneumonia, they are often efficacious agents.

Weak sinapisms, and emollient and narcotic cataplasms to the chest, have been useful, especially in children. The bowels, too, must be attended to, and, occasionally, the engorgement of the lungs has been found to disappear under the revellent action of a brisk cathartic.

Such would seem to be the most judicious mode of managing this severe, and always alarming, disease. It is proper, however, to observe that it has not unfrequently terminated favourably under treatment anything but heroic. "In order," says M. Grisolle—in his excellent work on Pneumonia—"to appreciate thoroughly the value of the various kinds of treatment cried up in pneumonia, it is indispensable, that we should know accurately the progress, duration, and most frequent termination of it, when treated purely on the expectant plan. But we have not the medium of comparison." He affirms, however, that M. Biett treated, during a whole year, all the cases of pneumonia that were received into his wards with emollient drinks and cataplasms only, and the mortality was very inconsiderable;—that M. Magendie employs no other treatment, and that he himself, in the year 1840, treated eleven cases, all perfectly characterized by the auscultatory phenomena, and by the expectoration, nearly in the same manner; the whole treatment consisting in confinement to bed, rigorous diet, pectoral ptisans, and—rarely, however—a mild cathartic, such as castor oil. All the patients perfectly recovered—the mean term of convalescence being the eleventh or twelfth day; yet in nine out of the eleven cases, the disease had reached the stage of red hepatization before the treatment was commenced. Very recently, too (June 13, 1847), Dr. Balfour read before the Medico-Chirurgical Society of Edinburgh notes on the practice of M. Skoda, the distinguished physician of Vienna, in which he contrasted the statistics with those of the Edinburgh Infirmary; and showed, that under M. Skoda's semi-expectant system pneumonia had a mortality of only 1 in 7·26—the average duration being 10 days; whilst in the Edinburgh Infirmary the mortality from the disease amounts to 1 in 2·78, and the average duration of treatment is 22 days. The ratio of deaths in the Edinburgh Infirmary is certainly very large; and all these results would seem to show, that pneumonia is probably more active and fatal in some countries and localities than in others; whilst it can scarcely be denied, that they equally establish, that many cases would do well under less active treatment.

Of late, iodide of potassium has been highly extolled by Dr. George L. Upshur, of Norfolk, Virginia, in the latter stages of pneumonia; and he has adduced several cases, which seem to him to prove, that it was of essential service even in the stage of gray hepatization, or, in other words, of purulent infiltration. He prescribes it in doses of at least one scruple in twenty-four hours, and considers it to be chiefly indicated,—*first*, in those cases of pneumonia that arise in anæmic persons, where the dis-

ease is characterized in its early stages by typhoid symptoms; *secondly*, in cases where inflammatory action, in the commencement high, has been reduced by antiphlogistic treatment, and the suppurative stage is just beginning,—a stage, which, he remarks, is easily recognised by a sudden depression of the vital powers, by a soft but irritable pulse, and by the bronchial respiration being accompanied by a harsh mucous rhonchus; and *lastly*, in those cases that are grafted upon long-continued intermittents, which have left the blood in a great degree impoverished.

In pneumonia, as well as in other inflammatory affections of malarious regions, the sulphate of quinia has been considered by Dr. W. M. Boling of Alabama to be peculiarly applicable, and this owing to its combining with sedative or antiphlogistic properties a power to control the periodicity of morbid action. "As an antiphlogistic remedy in healthy and elevated localities," he remarks, "it will probably never supersede the lancet, antimonials, &c., though it may in many cases be brought to their aid; but in malarious regions, ere long, it will generally be looked upon as the safest and most manageable contra-stimulant we possess, and at the same time one sufficiently powerful, while other agents of the same class will only be used to fulfil some casual indication, or as adjuvants to this the powerful remedy." To an adult, in a case in which its continued administration for a length of time is advisable, for the purpose of subduing inflammation by its sedative influence over the heart and arteries, Dr. Boling advises, that about forty-eight grains should be given in the twenty-four hours, in doses of about eight grains every four hours.

Throughout the whole period of the disease, mucilaginous or gummy drinks may be allowed,—as gum-water, barley-water, &c. &c.; and if the cough be troublesome, it may be alleviated by any of the expectorants advised in bronchitis. It must be recollected, however, that the cough is but a symptom, and will yield with the pathological condition, which induced it. The air of the chamber should be kept at a comfortable temperature, especially during the night; and mental and corporeal quietude be strictly enjoined. When the inflammation has been removed, milk, with the farinaceous preparations, as arrow-root, sago, &c., may be allowed, but great circumspection must be used to avoid errors in diet, which may be of extremely injurious tendency.

b. *Chronic Inflammation of the Lungs.*

Simple chronic pneumonia, regarded as an original affection, is undoubtedly a rare disease. This is the opinion of most pathologists. Some, however, are disposed to think, that it occurs more frequently, others more rarely, than is generally believed. We have stated, that simple chronic pneumonia is uncommon; but the scrofulous or tuberculous inflammation, which is chronic in its character, and accompanies the softening of tubercles—if it can be regarded as chronic pneumonia—is extremely frequent.

This form of the disease may be primarily chronic in its character; or it may be a sequel of the acute form; it may, also, occur in the

course of chronic bronchitis, or—as remarked above—be a complication of tuberculosis of the lungs.

Diagnosis.—The symptoms resemble those of chronic bronchitis, except that the dyspnœa is more considerable. Percussion yields a dull sound, but if the indurations be small, the evidence it affords may not lead to any positive knowledge. By auscultation, the crepitant rhonchus is heard disseminated; and, at times, there is bronchial respiration; at others, complete absence of respiration. Both the symptoms and physical signs resemble, therefore, those of the acute form of the disease; and the general symptoms have a great similarity to those of phthisis pulmonalis—emaciation, fever, and sometimes night-sweats.

Pathological Characters.—The lung is commonly found to present more or less of the red and gray indurations, with atrophy. The colour, however, varies; at times, it is pale-yellow, iron-gray, or even black; and different portions of the inflamed lung may have different tints, so as to exhibit a mottled appearance. It is singular, that the upper lobes of the lungs, according to M. Andral, are more frequently affected with chronic pneumonia than the lower, which is the opposite to what holds in acute pneumonia.

When the disease is limited to the state of red induration, it may terminate favourably; but if it should extend beyond this, the issue may be unfavourable, either owing to the disorganization occasioned by the primary affection, or to its giving rise to tubercles.

The carnification of the lung, met with in children, in which it bears considerable resemblance to the fœtal lung, so as to lead to the belief, that the pulmonary cells have been obliterated by disease, has been ascribed to chronic pneumonia, although often—it would appear—a state of *atelectasis*, or continuation of the fœtal condition.

Treatment.—It is essentially that of chronic inflammation;—revellents—as cupping, blistering, the tartarized antimony ointment, and mercurials given so as to affect the system slightly.

c. *Typhoid Inflammation of the Lungs.*

Synon. Pneumonia Typhoides seu Typhodes seu Typhosa, Pneumotyphus, Putrid, Typhoid, Adynamic, or Erysipelatous Pneumonia; *Ger.* Bösartige oder Nervöse Lungenentzündung.

Under this denomination, nosologists generally include inflammation of the lungs, often more or less latent, and accompanied by great prostration, and this, perhaps, dependent either upon the low state of the constitution, the complication with other diseases, or owing to the pulmonary affection being secondary to a general morbid condition. This form of pneumonia is met with everywhere. It is said to be, at times, so frequent in Dublin, as to be almost epidemic; and it is very common in this country. Dr. R. W. Gibbes, of Columbia, South Carolina,—states, that it prevails there extensively during the winter months in the river swamp plantations, and that it destroys more negroes than all the diseases combined to which they are ordinarily liable. South of the Potomac, it is affirmed by Professor Potter to be seldom so inflammatory as along the shores of New Jersey, Delaware, and Maryland; and the farther south, the more it is said to assume a typhoid complexion; but there is no regularity in its history in this respect. In all these situations, and elsewhere in the United States,

unless the symptoms of prostration are very great, it bears the name of *bilious pneumonia* or *bilious pleurisy—Pneumonia* seu *Pleuropneumonia* seu *Pleuritis biliosa*, *Pneumocholosis;* Ger. *Galligter Seitenstich*, *Galligte Lungenentzündung*. This term has been given, however, to different affections. The bilious pneumonia of Stoll is considered to have been pulmonary catarrh with disorder of the stomach or intestines; and, in other cases, the name has been assigned to inflammation of the lungs, presenting some symptoms of *embarras gastrique*, and accompanied by a yellowish expectoration, which has been supposed to be bile, but was really, according to M. Andral, produced by a mixture of blood and mucus. The disease, according to Dr. Gibbes, is known by various names, according to the predominance of particular symptoms. The more violent cases, being suddenly taken with a chill and cold skin, and often dying without any reaction, are sometimes termed *cold plague:* and as the head is almost always affected before the pneumonic symptoms are developed, it is sometimes called *head pleurisy*.

Typhoid pneumonia has been seen as a complication of gastro-enteritis, of true typhus, of malignant erysipelas, of diffuse cellular inflammation, of delirium tremens, of phlebitis, and, occasionally, it is apparently the sole disease. It is not uncommon in the insane, and is liable, in them, to be overlooked.

Diagnosis.—Typhoid pneumonia is often masked by the disease with which it may be complicated. Thus, the main evidences of the morbid condition may be those of common gastric or bilious fever; but if attention be paid, more or less dyspnœa and cough may generally be observed. The disease is often, however, extremely insidious in its progress, and is not suspected; the dyspnœa may suddenly become aggravated, the motions of the chest irregular, and death may take place in a very brief space of time from engorgement of the lungs. At times, the symptoms are wholly absent, but the physical signs may reveal the true nature of the case. A trifling cough, with or without expectoration, slight dyspnœa, and hurry of breathing may occur; yet the patient may not complain of his chest, although extensive and fatal mischief may be present. It has, indeed, been affirmed by Dr. Stokes, that, in this disease, the stethoscopist will over and over again detect the inflammation of the lung, when there has been no preceding cough, pain, dyspnœa or expectoration; and the author can corroborate the assertion.

In this form of pneumonia, extensive engorgement of the lung and solidification often take place rapidly; but, although this is the fact, the progress towards resolution is generally exceedingly slow; chronic hepatizations, with or without hectic fever, or a lurking congestion, may continue for weeks; and although, under appropriate management, the disease may be ultimately removed, atrophy of the lung, with or without ulcerative disease, is often established. In certain cases, months may elapse before the respiratory murmur is heard, and, in many instances it is never re-established. On the other hand, it has been known to cease in a single day, on the supervention of an attack of gastritis or enteritis.

Two analyses of the blood in pneumonia biliosa have been recorded

by M. Simon, in his "Animal Chemistry." In one of them, by Scherer, the clot was tolerably firm and tough, and covered with a greenish-yellow buffy coat. The serum exhibited a similar tint, and nitric acid indicated the existence of biliphæin in the urine. The conjunctiva was coloured yellow, and there was considerable gastric disturbance. The proportion of fibrin in the blood first drawn was 9·70; of corpuscles 124·60. In a third bleeding, upwards of three days after the first, the proportion of fibrin was 12·72; that of the corpuscles 118·47.

In the other case, by Heller, the clot was firm and slightly fuffed; the serum was of a deep yellowish-red colour, very alkaline, and on the addition of nitric acid a blue coagulum was formed, denoting the presence of biliphæin. The ratio of the fibrinous element was 6·113; of corpuscles 147·124.

Typhoid pneumonia may terminate in rapid and fatal hepatization, in gangrenous abscess, or it may induce chronic solidification or induration of the lung, which may end in the tubercular condition.

Treatment.—As the disease partakes of the characters of typhus and pneumonia, the mode of treatment must vary according to circumstances. In all cases, however, general bloodletting will have to be used with caution. It certainly can only be practised—if practised at all—at the very commencement of the attack. In robust individuals, where the bilious or gastric symptoms are more marked than the typhoid, it may be necessary; or, if it seem to be contraindicated, the joint depletory and revellent action of cupping may be employed with advantage. Revellents may be used here at an earlier stage, and with decidedly more advantage than in acute pneumonia. Mercury —with this view—may be given, as elsewhere directed, until the system is brought slightly under its influence; blisters may likewise be used much earlier, and with decided benefit; the patient should be clothed in flannel next the skin, and the warmth of his extremities be supported by adventitious aid, if necessary.

In cases in which the gastric or bilious complication is considerable, and especially if there be marked signs of gastro-enteritis, leeches may be applied over the region of the stomach, and a warm bread and milk, or flaxseed, poultice over the leech-bites. Emollient or anodyne enemata may also be prescribed, and caution should be employed in the use of cathartic remedies. In the debility, that attends the lowest forms and stages of this disease, it may become necessary to support the system; but, as in all similar instances, agents, belonging to the class of tonics or of gentle excitants, are preferable to the more powerful. Wine-whey, and the cold infusion of bark with acids, or any of the vegetable tonics, may be administered with good effects. The decoction of senega, with carbonate of ammonia, has, likewise, been extolled, when the patient becomes hectic, with copious expectoration.

The mild farinaceous articles of diet—as arrow-root, sago, or tapioca—may be given throughout the whole period of the disease; and, in the latter stages, wine may be added. Should the disease linger, and convalescence be tedious, change of air may be advisable

V. GANGRENE OF THE LUNG.

Synon. Gangræna seu Mortificatio Pulmonum, Anthrax seu Carbunculus Pulmonum, Pneumoscpsis, Pneumocace, Necropneumonia, Pneumonia gangrænosa; *Fr.* Gangrène du Poumon; *Ger.* Lungenbrand, Brandige Lungenentzündung, Putrescenz der Lungen, Lungenfäule.

Gangrene of the lung, would seem to be rarely the result of active inflammation. This is acknowledged by the majority of observers. Of 305 cases of pneumonia, analyzed by M. Grisolle, not one ended in gangrene; and of 75 cases of pulmonary gangrene, described in the Medical Journals, not more than 5, at the most, according to the same observer, could be fairly pointed out as the sequence of pneumonia. It is, according to M. Genest, a more common result of pulmonary apoplexy. The disease is not so unfrequent as is usually imagined. It does not often occur in private practice, but in eleemosynary institutions, into which those of broken-down constitutions are freely admitted, it is often seen. In the Philadelphia Hospital, a few cases are annually observed; in the nine months prior to August, 1838, four were admitted, all of which terminated fatally. The insane would seem *cæteris paribus* to be more liable to it than others. M. Guislain saw, within a short period, fifteen cases in the Insane Hospital at Ghent; and three examples, according to Hasse, occurred at the Bicêtre within four months. It is a disease, observes Dr. Craigie, "the presence of which it is difficult to distinguish in the early stages from that of other diseases of the lungs; its determining causes are totally unknown; and it is not known that, in any genuine instance of it, the patient has made a recovery." The two following cases, which fell under the author's care, and were reported by intelligent resident physicians, Drs. Vedder and J. B. Cottman, will illustrate the affection better than any general description.

Case 1.—A woman, aged thirty-three years,—who had been a patient in the Lunatic Asylum for about one year, and whose health was good until two months before her admission into the medical ward, after which period she was affected with severe cough,—complained, at her entrance, of considerable fever and dyspnœa, with paroxysms of coughing so violent as to threaten suffocation. She was bled to six ounces, which relieved the dyspnœa, and suspended the paroxysms of coughing.

℞.—Syrup. ipecac.
Tinct. opii camphor. āā f℥ss.
Mucilag. lini f℥v.—M.
Dose, a tablespoonful, every two hours.

On the 6th of July, the expectoration and breath became fetid. On the 8th, she presented the following condition:—Emaciation evident, but moderate; lies with her head elevated; expression of anxiety; nostrils dilate during inspiration; face slightly flushed; tongue red at the centre, white at the edges; respiration 60 per minute; breath extremely fetid; cough loose, and frequent; sputa dark-coloured and of a gangrenoid odour; pulse 138, small, and quick; œdema of both feet. *Physical signs.*—Chest, *anteriorly* on the left side;—respiration cavernous under the clavicle at its internal margin; bronchial exter-

nally; inferiorly, abundant sibilant and sonorous rhonchi, with sounds of bubbles of mucus; vesicular murmur feeble; pectoriloquy in the infraclavicular space. *Anteriorly*, right side.—Respiration cavernous, with gurgling under the clavicle; pectoriloquy marked; inferiorly, sibilant and sonorous rhonchi. Percussion on the left side anteriorly yielded a flat sound below the clavicle to the second rib, rather dull below; on the right side, a flat sound to the third rib, dull below. *Posteriorly*:—the respiration on the left side, at the summit, bronchial, with resonance of the voice; throughout the remainder of this side feeble. On the right side, respiration cavernous, with gurgling,—on coughing, the air seeming to pass through a constricted orifice: the splashing of the fluid can be heard against the walls of the cavity. This character of respiration extends to the middle of the chest; it is rude below this. In the corresponding part, there is intense pectoriloquy. On percussion, the sound is flat in the superior half of the right side, clear below. On the left side, it is dull at the summit, and nearly natural below. (Add to the mixture *liquor. sodæ chlorin.* f3ss. —Nutritious diet, with six ounces of wine to be made into whey.) On the 10th of July, there was more oppression; the strength had diminished; the skin was above the natural temperature; pulse 150, and feeble; respiration 56 in the minute, laboured, and interrupted by coughing; sputa of the same fetid character. On the morning of the 11th, at the visit of the author, she was evidently moribund; breathing extremely difficult, and abdominal; skin covered with a cold clammy sweat; extremities cold; pulse scarcely perceptible at the wrist; countenance anxious; yet her mind was active, and the amount of intellectual manifestations as usual. She died about one o'clock, P. M. Unfortunately, permission could not be obtained to examine the body.

Case 2.—The last case was one of gangrene of the lungs supervening on phthisis. The following is one of pleuropneumonia followed by the same results. A man, aged 38, had always enjoyed good health until about seven years ago; his parents were healthy, and there was no hereditary disease in the family. About the period mentioned, he had an attack of intermittent fever, of which he recovered in about nine months, and remained healthy until the first of August, 1839, when he was attacked with cough; had no pain in the chest; became very weak in a short time, and was compelled to give up labour; had been at work for six or eight months in a tunnel; was often wet all day, and frequently, during the winter, his shirt would freeze to his back. He gradually grew worse until the 11th of June, when he was admitted into the hospital affected with bronchitis. He remained there until the 2d of July, when he was discharged cured of his affection; there still, however, remained some cough, with slight dulness on percussion under the right clavicle, and a difference in the respiration of the two sides of the chest. He went on the farm to work, and caught cold, when he was again admitted into the hospital, and fell under the care of the author. He was emaciated; face flushed; general appearance very much attenuated since he left the hospital; respiration laboured; cough troublesome; complains of no pain; skin hot and dry; pulse 100, weak and feeble. On the chest there was

an elevation as large as a goose's egg, where the fifth and sixth cartilages on the right side join the ribs, for which he could give no satisfactory reason. Percussion anteriorly, on the right side, gave a flat sound in the upper portion; a clear sound in the middle, and a dull one in the lower. Anteriorly, on the left side, the sound is flat throughout. Respiration, anteriorly on the right side, bronchial in the upper portion; vesicular in the middle; feebly vesicular in the lower. Anteriorly, on the left side, rude at the summit; feebly vesicular throughout the remainder. Posteriorly, the physical signs correspond to those anteriorly, except that the respiration at the summit of the left lung is heard more distinctly than anteriorly. Impulse of heart greater than natural. (*Four cups* were directed to be applied to the chest, with a *mucilaginous mixture* for the cough; *farinaceous diet* and *ice*.) On the 12th the fever still continued, the skin being hot and dry, and the thirst very great; respiration much oppressed. (The *cupping* was repeated.) On the 14th respiration was easier; face flushed; skin hot and dry; pulse 120, quick and feeble. On the 18th, the emaciation had advanced; cough troublesome; expectoration very abundant, and excessively fetid, consisting mostly, however, of mucus; face pale; skin cold and moist; respiration oppressed; complains much of weakness; (*Calcis. chlorin.* gr. iv. every three hours; *dry cupping* to the chest; continue the *pectoral mixture*, and let him have *four ounces of wine* in the twenty-four hours.) On the 19th, he was very much emaciated. He had vomited frequently; was unable, indeed, to retain anything on his stomach; expectoration about two pints in the twenty-four hours; breath of a gangrenous odour, and so unpleasant, that it was loathsome to examine the chest. On the 21st, the patient was evidently sinking fast, and the odour exhaled by him, was so disagreeable, that no one would go near him. He died on the morning of the 22d of August.

On opening the chest, no particular lesion was found corresponding to the prominence on the right side. The pleura costalis was adherent throughout to the pleura pulmonalis. On the left side, the adhesions could not be separated, until the lung was removed from the chest. On the right side, the pleuræ were adherent about half-way up from the base of the lung; the remainder of their surfaces was bound together by bands of lymph. One-third of the upper lobe of the right lung was slightly emphysematous; a few miliary tubercles were scattered through it; the remainder was of a purple or greenish tint externally; when cut into, the tissue was softened, engorged with bloody serum, and presented numerous cavities of different sizes, some as large as a ten-cent piece, filled with a purulent matter, and very fetid. Some of the cavities were lined by a distinct false membrane; others were proceeding to ulceration; many of the smaller cavities did not appear distinct, but merely distended vesicles, filled, however, with a matter similar to that contained in the larger; the middle and lower lobes exhibited the same appearance; the bronchial tubes on the right side were very much enlarged, of twice the natural size; the larger of a pale pink colour; the smaller of a deep red, terminating in a distinct *cul-de-sac*. The bronchial glands were

enlarged; colour natural; consistence soft. The summit of the upper lobe of the left lung was emphysematous, the remainder healthy, except in a few spots at the lower portion, where gangrene had commenced, and the lung presented the same appearance as already described. The middle and lower lobes were in the same state as on the right side; the bronchial tubes were enlarged; their lining membrane slightly roughened, and of a rose colour. Such were the chief pathological appearances. (*American Medical Intelligencer*, August 1, 1838, and October 15, 1839.)

Gangrene of the lungs may be *diffused* or *circumscribed*, and where recovery takes place, it is of the latter class. In all the cases, that have fallen under the author's observation, the subjects were addicted to spirituous liquors. The only pathognomonic symptom, as has been correctly observed by Dr. Stokes, is the extraordinary and disgusting odour of the breath and expectoration, which is generally constant; but, in some cases, it may not be readily appreciated, unless the patient be made to cough.

The disease has been observed at all ages; and it would appear from the researches of M. Boudet to be more frequent in infancy. According to Laënnec, it is incomparably more common in men than in women, and such is the experience of the author. It may occur when the patient is in good health; but more frequently it supervenes in different morbid conditions. In children it frequently follows one of the eruptive fevers; and at all ages it is met with in the course of chronic bronchitis, or pneumonia attacking enfeebled subjects.

Pathological Characters.—In the diffuse form, the disease may occupy a portion or the whole of the lung; the affected part may vary in colour from a gray to a blackish hue; the tissue of the lung is friable, and exhaling a gangrenous odour. On cutting into it, a liquid escapes which has been compared to a mixture of soot and water; and if the lung be placed under a stream of water, a blackish and fetid *detritus* or disorganized matter washes away, leaving in its place a corresponding excavation. In the circumscribed form, which is more common, the gangrenous portion is in smaller masses, exhibiting, however, much the same characters. The slough adheres at times, to the surrounding parts, but at others is entirely separated, when it forms a kind of gangrenous abscess, filled with a blackish, fetid fluid, and mixed with shreds of the pulmonary tissue.

Treatment.—This consists in the employment of the chlorinated preparations internally, or of chlorine by inhalation: in allaying irritation by opium, and supporting the patient by wine-whey and nourishing diet.

VI. ŒDEMA OF THE LUNGS.

Synon. Œdema pulmonum, Pneumochysis, Hydrops pulmonum, Hydropneumonia; *Fr.* Œdème des Poumons; *Ger.* Lungenwassersucht, Lungenœdem, Lungenwassererguss.

This affection is common, but it certainly is not readily diagnosticated, and is more frequently secondary than primary.

Diagnosis.—It is described as occurring under three different forms.

1. The *super-acute*. In this, the patient, at the time in perfect health, or in the course of an acute disease, is suddenly seized with symptoms of suffocation, which end in death by asphyxia. This may be the result in two or three hours, or not for as many days. 2. The *acute*, likewise characterized by considerable dyspnœa, which augments for from four to twelve days, and ends in complete prostration, during which the fatal termination occurs. 3. The *chronic*,—*Œdema pulmonum chronicum*, *Hydropneumon*, *Hydrops pulmonum cellulosus*, *Anasarca pulmonum*; Ger. *Lungenwassersucht*, *Chronische Lungenœdem*. In this form, the dyspnœa may be slight or null for months whilst the patient is in a state of rest, but it may appear with more or less intensity during exercise, coughing and expectoration. In all these forms, percussion affords a more or less obscure sound, according to the degree of the disease. Auscultation, too, exhibits, that the vesicular murmur is much more feeble than in the natural state, and that it is accompanied by a subcrepitant rhonchus, less than that of pneumonia in the first degree, and with moister and more bulky bubbles. "It must, however, be acknowledged," says the best describer of this disease—Laënnec—"that it is sometimes difficult to distinguish these two diseases from each other, by the signs alone, that are furnished by the cylinder, and that it is requisite to associate with them the comparison of the general symptoms. When the œdema is very extensive, and very intense, the sonorousness of the chest diminishes in a sufficiently marked manner; and a slight bronchophony is manifested in such cases, especially at the root of the lung; but the long persistence of the crepitant rhonchus, and the absence of the general signs of inflammation almost always permit œdema of the lungs to be distinguished from pneumonia in the first degree, even in cases where these affections are united."

Œdema of the lungs may be a primary affection, or it may develope itself in the course of different diseases—as acute bronchitis, acute pneumonia, diseases of the heart, and those of the brain,—such as cerebral hemorrhage, softening of the eighth pair of nerves, or pressure upon them by serum. It is said to supervene also, under the influence of general dropsy, and, according to M. Andral, in the course of all chronic maladies, which require decubitus on the back. Hasse states, that there is hardly a single disease of the lungs or heart, which is not, prior to its fatal termination, more or less complicated with pulmonary œdema.

Pathological Characters.—The tissue of the lung, which is of a pale grayish or yellowish colour, is more dense and heavy than in its natural state; it crepitates, and if, by compression, it be freed from the liquid it contains, it preserves the impression of the finger. The lung is gorged with a colourless, transparent, frothy fluid, but the air-cells retain their natural texture.

Treatment.—As the disease is induced by such different conditions of the system, it is difficult to lay down any precise plan of treatment. The practitioner must be guided by the particular indications that present themselves.

VII. EMPHYSEMA OF THE LUNGS.

Synon. Emphysema pulmonum, Pneumatosis pulmonum, Pulmonary Emphysema, Asthma aëreum ab Emphysemate Pulmonum, Pneumonectasis, Pneumoëctasis, Dilatation of the air-cells; *Fr.* Emphysème du Poumon; *Ger.* Lungenemphysem, Erweiterung der Lungenbläschen.

Emphysema of the lungs was first described by Laënnec, but it was not much regarded until the attention of pathologists was re-directed to it by the investigations of M. Louis. Yet it is by no means an uncommon disease. The writer, last cited, describes it, indeed, as "one of the most frequent and remarkable affections in the whole catalogue of nosology." In 53 cases of cholera, 23 of the individuals were found by him to be more or less affected with emphysema; nor was there again ground to believe that it had been developed during the fatal malady: and an experienced observer, according to Hasse, on minutely examining a lung, will seldom fail to find some of its vesicles dilated. Two forms have been described; one in which the disease is confined to the vesicles or air-cells—hence called *Vesicular Emphysema;* and the other in which infiltration of air has taken place into the cellular tissue, connecting and separating the lobules of the lungs;—hence termed *Interlobular Emphysema.* To this last form of the disease, the term *Emphysema of the lungs* appears more appropriate; inasmuch as in the opinion of many excellent observers, the other concerns the terminal extremities of the bronchial tubes; a recent writer, however, M. Lombard—who divides emphysema of the lungs into three forms—the *vesicular*, *lobular*, and *lobar*, discards the interlobular, because it is external to the pulmonary tissue, and therefore not "a lesion of the organs of respiration"! The term "Emphysema" has, indeed, been regarded as altogether improper, inasmuch as it is not the principal characteristic of the disease, and although a frequent, by no means a constant, complication.

a. *Vesicular Emphysema.*

This affection consists essentially in dilatation of the air-cells: the lung, consequently, becomes increased in size, and the quantity of air within the chest, as well as the capacity of the chest itself, is augmented.

Diagnosis.—One of the best descriptions of the disease, is that by M. Louis, translated by Dr. Stewardson, of Philadelphia. It is unattended by fever, and is of long duration, commencing frequently in early youth, and very rarely after fifty years of age. The first symptom is slight dyspnœa, which generally continues, without aggravation, for a number of years when it dates from infancy; and afterwards becomes more and more marked, occurring in paroxysms, during which the patient appears at times to be threatened with suffocation. The dyspnœa is often preceded by cough, and is almost always accompanied, at some period or other of its course, by bronchitis, which, when aggravated, would seem to be one of the most common causes of the paroxysms of dyspnœa. The disease is, indeed, considered by some, as by Messrs Laënnec and Stokes, to be the result of bronchitis,—the mucous secretion of which cannot be readily expectorated, and therefore dilates

the vesicles; but this is denied by M. Louis, because, in the cases which he has observed, the emphysema was rarely preceded by bronchitis, and the bronchial tubes, in the vicinity of the dilated vesicles, were found empty, containing neither mucus nor false membrane.

Connected with the symptoms above described is an alteration of the form of the chest, generally of limited extent, implicating both the ribs and intercostal spaces, and the common seat of which is the anterior part of the thorax, and the supraclavicular regions. The shoulders are elevated and brought forward, and the patient stoops habitually, owing to the relief, which he has found from bending the body forward. To such an extent does the habit of stooping alter the configuration of the chest, that the acromial, interscapular, supra-spinous and sub-spinous surfaces may become nearly horizontal. In some cases, the heart is displaced by the dilated lung, which pushes it downwards, so that its impulses become manifest in the epigastric region.

The chief physical signs are the greater sonorousness of the elevated portions of the chest on percussion, and the diminution of the sound of respiration on auscultation. A sibilant or subcrepitant *râle* is often mixed with the respiratory murmur; and, in some patients, at a more or less advanced stage of the disease, there is palpitation, with œdema of the lower extremities.

The dyspnœa is regarded as almost pathognomonic of emphysema, if we take into consideration its commencement at an early age; its duration; its being continuous, although paroxysmal; and unattended by, or separable from, the other symptoms of diseases of the heart. It cannot easily be mistaken for chronic bronchitis, as the latter does not give rise to paroxysms of dyspnœa, to prominence of the chest, and to constant diminution of the respiratory murmur. From dilatation of the bronchia, it is known by the respiration in the latter, instead of being weaker, being stronger throughout a certain extent than in the natural condition, and the voice being more resonant. From tuberculosis of the lungs, it is known by the circumstance, that in the latter there is flatness on percussion in some part, whilst in emphysema the sound is clearer than common, and there is, in general, neither emaciation nor fever. From aneurism of the aorta, or any tumour, which might compress the trachea, or a large bronchial tube, it is distinguished by the dyspnœa, in these cases, being more severe and more constant, and generally accompanied by a whizzing sound, which does not occur in emphysema.

The physiognomy of an individual labouring under this disease has been esteemedal most characteristic;—the complexion being of a dusky hue, and the countenance, although with an anxious and melancholy expression, having, in several cases, a degree of fulness, which contrasts greatly with the condition of the rest of the body. This has been supposed to result from hypertrophy of the cellular membrane, and of the respiratory muscles of the face; the first produced by repetitions of venous obstruction, and the second by the violent exertion of the whole system of respiratory muscles. The nostrils are dilated, thickened, and vascular; the lower lip is enlarged, and its mucous

membrane everted and livid, so as to give a peculiar expression of anxiety, melancholy, and disease to the countenance.

The following modes have been pointed out for distinguishing emphysema of the upper and lower lobes—conditions which, however, are seldom absolutely distinct.

Emphysema without displacement of the diaphragm.	*Emphysema with displacement of the diaphragm.*
1. The shoulders greatly elevated, and the upper part of the chest convex.	1. The shoulders not affected; the upper part of the chest flat, and the convexity only evident inferiorly.
2. The sound on percussion of the upper portions morbidly clear; of the lower, little altered.	2. The reverse.
3. The stethoscopic signs of the disease manifest in the upper portions.	3. These signs predominating in the lower lobes, and audible below the usual level of the diaphragm.
4. The epigastrium collapsed, and the heart and liver in their natural situations.	4. The epigastrium full and resisting; the right hypochondrium dull on percussion, and the heart displaced downwards.
5. The distress in breathing much less except during an exacerbation of bronchitis.	5. The dyspnœa much more permanent, and less affected by treatment calculated to relieve bronchitis.

The course of the disease is chronic, yet it is subject to variations. In many cases, it continues for years in a mild form, with but little change. In other cases, it has come on with some degree of violence, yet the subjects have attained advanced age. In rare cases, its progress has been more rapid.

Causes.—With regard to the causes of vesicular emphysema, it has been already remarked, that it probably is not always dependent upon bronchitis, as is believed by some: the same may be said of pneumonia, as a cause, notwithstanding it is accompanied by dilatation of the vesicles. The immediate cause of the dilatation we are unable to appreciate; nor is it explained by the assertion of M. Louis, that both in this form of dilatation, and in that of the larger bronchial tubes, "we must admit, at least in a great number of cases, a force analogous to that, which presides over the extension of hollow organs, and in virtue of which these latter enlarge, without our being able to account for it by means of any obstacle or mechanical cause." M. Rokitansky believes that it is commonly the result of forced inspirations, such as occur in croup, hooping-cough, &c. Dr. G. Budd ascribes it to a want of elasticity in the lung, or, in other words, to absence of its natural tendency to collapse. The powerful muscles of inspiration are continually acting to dilate the chest, and thence, by virtue of atmospheric pressure, the air-cells. This agency is not counteracted as it should be by the natural elasticity of the lung, and the air-cells as well as the cavity of the chest, are, in consequence, permanently dilated.

The disease has been observed to supervene after a powerful moral emotion.

The question as to its hereditary character was closely and ably investigated by a young American physician, too soon lost to science, Dr. J. Jackson, Jr., of Boston, who was a worthy pupil of a distinguished master, M. Louis, and the following are the results at which he arrived: 1. Of twenty-eight patients, affected with pulmonary em-

physema, eighteen were the offspring of parents, one of whom had been attacked with the same affection, and several of whom had died in the course of it. In some cases, the same was true of the brothers and sisters. 2. Of fifty individuals not affected with emphysema, three only were descended of parents, who laboured under the disease; whence it would follow that emphysema is frequently an hereditary affection. It would appear, too, that hereditary influence is much more marked, where the emphysema dates from early infancy, than in those in whom it commences immediately before, or subsequent to the age of twenty. It was found, for instance, that of fourteen individuals, whose dyspnœa was traced to early youth, fourteen had asthmatic parents, whilst of fourteen attacked later in life, two only were the offspring of parents who had died of the same disease.

Pathological Characters.—On opening the thorax, the lungs do not collapse, and are more bulky than in health; the vesicles are dilated, and this dilatation is always more marked at the free border than in other parts of the lung; and, along the free border, peculiar appendices are met with, which result from the laceration of the pulmonary vesicles, and the form, size, and structure of which are very variable. The dilatation, according to MM. Andral and Louis, rarely implicates the bronchial tubes.

The extent of the emphysema differs in different cases, but it seems to affect both lungs nearly alike. Of 43 cases referred to by M. Louis, it was found on the left side in 23; on the right, in 20. It would appear to affect the upper lobe more frequently than the lower. In most of the cases, the heart was larger than natural; and this circumstance has given rise to the idea, with some, that emphysema is a secondary disease in all cases; and hence, that it is important to seek out the primary lesion. It is probable, that this may be the case in many instances; and yet it is equally, if not more probable, that the emphysema itself may have reacted on the heart, and given rise to morbid conditions of that viscus. In many of the patients, observed by M. Louis, adhesions were found between the lungs and the pleura, and tubercles were, likewise, met with not unfrequently in the lungs, but there was no reason for believing, that they were in any respect concerned in the causation of the emphysema. M. Wunderlich affirms, that he has seen marked cases of pulmonary emphysema with tubercles and tuberculous cavities in the lungs; yet Dr. Ramadge regards the existence of emphysema a curative agency in tubercles, and founds his treatment on that hypothesis!

Treatment.—When the disease has existed from an early age, it is not probable, that any remedial agency can do more than palliate the symptoms. It has, indeed, been affirmed by Drs. Stokes and Osborne, that, under treatment calculated to remove bronchial irritation, the vesicular murmur may return, and the volume of the lung be diminished. The disease is certainly susceptible of alleviation; but, except in very recent cases, it can scarcely be cured. All mental and corporeal agitation—as well as everything that can irritate the lungs in particular—must be carefully avoided; and if the patient experience relief in one place rather than in another, or by change of air, it may be recom-

mended to him, where his circumstances will admit of it. The various means, that have been advised under Bronchitis for allaying bronchial irritation and cough, may be used here, and great advantage is said, by some, to have resulted from their employment. On the other hand, their use has not been found productive of much benefit in the hands of others. Opium is the therapeutical agent, which has exerted the greatest effect on the dyspnœa. Almost all those to whom M. Louis gave it were remarkably improved, and the symptoms resumed their former violence as soon as its use was suspended, unless they had been relieved for a certain length of time.

When the affection is accompanied by disease of the heart, the treatment will have to vary according to its nature, and to the rules laid down elsewhere. Hypertrophy with dilatation of the cavities of the heart is the most frequent complication; but, as remarked by M. Louis, it must be borne in mind, that the dyspnœa, which the patient experiences, is owing, in a great measure, to the emphysema, and that it is not sensibly influenced by bloodletting, in the majority of cases certainly; and, hence, this remedy should be used with caution.

The diet and regimen must be so regulated as to keep down any acceleration of the circulation, which could not fail to augment the dyspnœa.

b. *Interlobular Emphysema.*

This variety of emphysema—as before remarked—is owing to the infiltration of air into the interlobular cellular tissue. Professor Gross is disposed to believe, that it is quite common in the Western States, which is singular, if correct; for it is a disease of rare occurrence. Hasse says he has never seen it before death, nor detected its traces afterwards, except in subjects where rapid decomposition had caused the evolution of gases within the cellular tissue of various other organs.

Diagnosis.—Dyspnœa is here also the main symptom, and it is proportionate to the extent of the mischief. If it be slight, neither percussion nor auscultation may throw any light upon it; but if to a greater extent, the resonance may be louder on percussion over the seat of the lesion, and the dry, crepitant rhonchus with large bubbles may be more especially manifest during inspiration. Along with these signs, a sound of friction during both inspiration and expiration has been described; but it has been properly remarked, that this point of diagnosis requires farther investigation. When healthy serous membranes rub against each other, they give rise to no friction sound; but if, owing to inflammation, they become dry, or the seat of morbid exudations and changes, such a sound may be elicited as in pericarditis, pleurisy, and peritonitis. It is, therefore, probable that, when the friction-sound is heard in interlobular emphysema, it is owing rather to slight pleurisy than to the existence of the subpleural vesicles of Laënnec.

Another diagnostic sign of pulmonary emphysema—in both the vesicular and interlobular form—is the difficulty of breathing out, which has been attributed by some to obstruction of the minute bron-

chial tubes; by others—and more properly perhaps—to diminished elasticity of the lung itself.

Causes.—It has been affirmed, that the disease may occur spontaneously, owing to a simple exhalation of air into the interlobular cellular tissue, but this is probably not often the case. Generally, the air-vesicles give way, and infiltration takes place, under some mechanical injury or violent effort. Of nineteen cases of the disease, of which a record was kept, six, according to Professor Gross, occurred in association with bilious and typhoid fever, four with dysentery, three with hooping-cough, one with acute inflammation of the lungs, four with tubercular phthisis, and one with cholera infantum. In twelve of these cases, the emphysema affected both lungs, though not to the same extent. In five, it was confined exclusively to the right lung; in two, to the left.

Pathological Characters.—The cellular tissue between the lobules of the lung is infiltrated with air, and the surface of those organs presents small vesicles or ampullæ, arranged in transparent strips or bands, which penetrate more or less deeply into the pulmonary tissue. These bubbles of air have likewise been observed frequently in the course of the vessels, that traverse the lungs, and along those that run on its surface.

Emphysema does not occur frequently at the base of the lung. When it does so, it is apt to pass to the mediastinum, and thence to the cellular tissue of other parts of the body, so as to cause general emphysema. In such cases, if the ordinary symptoms and signs of pulmonary emphysema be present, there can be no difficulty in the diagnosis. The following is a case of this kind:—It is given by Mr. Lilburn.—A child, four years old, labouring under hooping-cough, was found lying in a state of coma consequent on convulsions, with emphysema above the left clavicle, which, in a few days, extended through the cellular texture of the whole body, and was so extensive over the abdomen and ribs as to raise the skin at least one inch. From the puffed appearance of the child's face, his friends could not recognise him. The main treatment consisted in keeping the child as quiet as possible, giving a solution of tartarized antimony with tincture of digitalis, in frequently repeated doses, to reduce the circulation and respiration to the lowest possible amount, and regulating the bowels daily by a gentle cathartic. The diet was restricted to a pint and a half of asses' milk *per diem*. After about a fortnight, the crepitus began to subside, and ultimately disappeared.

Treatment.—This does not differ from that of vesicular emphysema. It can rarely be necessary to treat any case as actively as the one just described. The cares, recommended under the head of vesicular emphysema, are equally demanded in the interlobular form. The disease, although tedious, is not of grave prognosis. The air in the cellular membrane is gradually absorbed, and the dyspnœa becomes greatly diminished, and more frequently wholly removed than in the vesicular form, in which the dilatation of the vesicles remains generally, if not always, permanent. By M. Prus, however, emphysema

of the lung has been regarded as a cause of sudden death; but, in the discussion which followed the reading of a *mémoire* by him before the *Académie Royale de Médecine* in Feb. 1843, great difference of opinion existed on this point.

VIII. ASTHMA.

Synon. Asthma convulsivum, A. spasticum adultorum, A. nervosum, A. seniorum, A. spasticum intermittens, Dyspnœa et Orthopnœa convulsiva, Malum caducum pulmonum, Broken-windedness, Nervous Asthma, Convulsive Asthma, Bronchial Asthma; *Fr.* Asthme, A. nerveux; *Ger.* Engbrüstigkeit, Krampfhafte Engbrüstigkeit, Convulsivisches Asthma, Brustkrampf, Dampf.

The terms dyspnœa, asthma, and orthopnœa, were formerly employed to designate different degrees of difficulty of breathing; but their signification is now more precise;—*dyspnœa* being appropriated to difficulty of breathing in general; *asthma* to the disease now to be described; and *orthopnœa* to that great difficulty of breathing, in which the patient is incapable of respiring except in the erect posture.

It has not been unusual to divide asthma into two varieties; the one constituting the *essential* or *idiopathic* disease; and the other the *secondary* or *consecutive;* the former not being depending, so far as can be detected, upon disease of any other organ, whilst the latter may be clearly associated with, and is perhaps dependent upon, appreciable affections of the lungs, heart, great vessels, &c. The former of these will alone engage us here. It has been a question, however, whether any essential nervous asthma exist, or whether there be not always some organic lesion. Many of the best observers have had their attention directed to this point, but they have been totally unable to discover any morbid appearances sufficient to account for the disease. Hence it is, that M. Andral always uses the term *nervous asthma* for the affection under consideration, and he adduces, in support of his view, arguments drawn from physiology, which have great force,—the effects, for example, of compressing, tying, or dividing the pneumogastric nerves, and of disease at the encephalic origin of those nerves, or of the nerves themselves; the fact, that the attack is often brought on by nervous agitation; that the patient is in perfect health between the paroxysms, &c. &c.;—but to this point of pathology reference will be made hereafter.

True asthma belongs to the more rare maladies. M. Wunderlich affirms, that of 10,000 clinical patients who had fallen under his care in six years, he had met with only three cases, that could probably be referred to it with correctness.

Diagnosis.—The paroxysms of asthma come on, at times, without any premonition, and instantaneously; at other times, there is a sensation of oppression or of fulness at the pit of the stomach—which is commonly owing to the presence of flatus in that organ—with a feeling of irritation in the air-passages. These premonitory symptoms are, however, extremely uncertain. The paroxysms themselves usually commence at night, and between the hours of ten and two: they rarely occur during the day. If the patient be lying down, he immediately rises, and remains sitting up, experiencing a sense of

violent constriction over the whole chest; the arms are thrown back to facilitate inspiration; the shoulders are raised, and the head is often violently straightened on the neck; the patient lays hold of any object that may afford him support; all the inspiratory muscles are in full action; the inspirations are quick, suddenly interrupted, and repeated at short intervals; the patient demands that more cool air should be admitted into the apartment, and feels as if he were about to be suffocated: the respiration is sibilant, and sometimes sonorous. Along with these symptoms, there is, usually, a small, frequent, broken and dry cough; the face is pale, sometimes livid; the eyes anxious and projecting; and the surface of the body covered with a cold and copious perspiration. The stomach is frequently more or less disordered, and vomiting is not an uncommon attendant. The condition of the pulse, as to force, frequency, and fulness, varies; it is commonly, perhaps, frequent, small, and contracted.

During a paroxysm, the chest does not sound well on percussion, and the respiratory murmur is indistinct, even on the most full inspiration. But if the patient, after holding his breath a little, be requested to breathe again quietly, the spasm will be overcome, "as it were by surprise,"—to use the language of Dr. C. J. B. Williams, and the entry of the air into the cells will be heard in a clear, and, at times, puerile manner. This may be done by desiring the patient to read aloud, or speak as many words as he conveniently can without taking breath, and then to breathe at his ease. But after one or two inspirations, the spasm returns, and the respiration is as dull as ever.

The usual duration of a paroxysm of nervous or spasmodic asthma is three or four hours; after this, the symptoms generally become mitigated. When it has attained its height, the cough usually becomes more free, and the expectoration more easy and copious; the sputa are transparent, colourless, and viscid; and, occasionally, of a sweetish, but oftener of a salt taste: and towards the termination they are ropy and similar to a solution of gum tragacanth. At times, they have been observed as if moulded to the bronchia, but in such cases, there is doubtless inflammation of the lining membrane of the tubes, of which this plastic secretion is one of the evidences. Whilst the respiration and expectoration are becoming more free, eructations of gas generally take place from the stomach; the pulse becomes more full and free; the countenance resumes its natural expression; the urine, which was at first perhaps pale, watery, limpid and copious, becomes of a darker colour, less copious, and at times altogether suppressed, and at length the patient, exhausted, sinks to sleep. On awaking, he may find himself entirely restored, but, almost always, there is more or less pain in the region of the diaphragm, with dyspnœa, which—if the paroxysm be about to return on the following night—may continue through the whole day. Towards midnight, there may be a return of the paroxysm, and this may be the case for three or four nights, after which the individual may be restored to his accustomed health. This succession of paroxysms constitutes an attack of asthma.

Asthma is very rarely fatal. The most violent attacks, which seem

to threaten instant suffocation, almost always terminate favourably. The author has never seen a fatal case during the paroxysm; but should such an event occur, we are told it will be immediately preceded by most distressing anhelation; frothing of the mouth; livid countenance; weak, tremulous, or total failure of, pulse; great depression of general strength, and, sometimes, more or less paralysis of the upper extremities; yet, most of these symptoms are often present, and the patient recovers. The great danger consists in the repeated recurrence of the paroxysms, which may give rise to other affections, and especially of the heart and great vessels. It may happen, also, that death may occur during a paroxysm, owing to cerebral hemorrhage, or to the rupture of some important vessel or viscus; but these are collateral dangers. The recurrence of the attacks is extremely irregular. Cases are on record, in which it would seem to have observed regular periods, but this is not common.

The varieties of asthma, usually described—by the German writers especially—are numerous. Under the name *Asthma with puerile respiration* has been understood—dyspnœa, which is dependent upon an increase of the desire to respire,—the respiration being, in other respects, perfect. The respiratory murmur is found to have resumed all the intensity, which it possessed in early infancy, and yet the patient is oppressed, especially on taking the least exercise. This form of dyspnœa, is chiefly observed in the course of chronic bronchitis; and its precise nature is not readily appreciable. Nervous asthma itself has been usually divided into two forms; in the one, commonly regarded as *Nervous asthma*, properly so called, there is no expectoration after the paroxysm. It has been termed *Asthma siccum, Asthma spasticum siccum.* This variety is, however, of rare occurrence: in the other, the *Catarrhal asthma, Asthma humidum, A. aquosum, A. pituitosum;* Fr. *Asthme humide;* Ger. *feuchtes Asthma. Schleimasthma,* the paroxysm is usually followed by a copious expectoration of mucus. When accompanied by pain in the epigastrium, flatus, eructations, vomiting, &c., it has been termed by some, *Gastric asthma, A. abdominale, A. flatulentum, A. ab acrimoniâ,* &c.

Causes.—It is not easy to state in what the predisposition to asthma consists. It is generally believed, that a peculiar conformation, derived from progenitors, predisposes to it; but this probably applies rather to emphysema of the lungs, than to asthma; and many of the cases, that are recorded of asthma in young children belong unquestionably to emphysema.

Among the causes, that give rise to the paroxysms, atmospheric variations have been enumerated. In general, a cold and dry air suits the asthmatic, but there are singular differences in this respect. With some, closing the door of a room will bring on a paroxysm; with others, darkness greatly increases the violence of the attacks. A recent writer of eminence, Dr. Graves, has given the following example in elucidation of this singular feature of the disease. In December, 1839, he attended two gentlemen residing in the same street, and each about forty-five years old. Neither was liable to any other disease, and they were both short and stout. On a very cold morning,

Dr. Graves found one of them very ill. He had not slept at all during the night, and had every moment been on the point of smothering from asthmatic dyspnœa. The extreme violence of the paroxysm he attributed to the fact, that his bedroom chimney had smoked occasionally during the night, and the weather was so cold, that he was afraid to open the windows to let out the smoke. Dr. Graves ordered him to change his room, and then proceeded to visit his neighbour, and found him sitting in a room full of smoke. The patient apologized to the doctor for introducing him into so disagreeable an atmosphere, and explained, that when the fit of asthma became very bad, the only sure means for obtaining relief, which he knew of, was to get a good coal fire lighted in the grate, which being done he made his servant occasionally obstruct the progress of the smoke up the chimney, and thus maintain a certain density of smoke in the room. This never failed to afford him relief. This gentleman was of very active habits; was agent to several large properties, and, consequently, obliged to travel much about the country; experience had proved to him, that he could derive no benefit from turf smoke, and, therefore, he never stopped at any inn, where they had no other fuel but turf, as he felt himself insecure, unless he could procure coal smoke, in case of an asthmatic attack.

Various odours—agreeable or disagreeable; smoke; dust; irritating gases; metallic and other particles floating in the air, unquestionably act as exciting causes; and to these has been added—air surcharged with electricity, as well as different lunar phases, but the author has not had the slightest reason for believing in the influence of the latter. Some asthmatics are so sensible of atmospheric changes, that, according to Broussais, they are aware of the presence of a cloud in the sky, and can predict storms from the increase of their dyspnœa. In like manner, it can be understood, that irregularities of diet, especially when food in too great quantity, or improper in quality, has been taken; the abuse of alcoholic liquors; the suppression of any accustomed discharge, and the transference of irritation thereby engendered; too great exertion of any kind, and mental emotions;—in short, undue moral or physical excitement of any kind, may induce a return of the paroxysms.

There is something extremely inexplicable in the fact, that the air of contiguous localities, and even of different parts of the same house, may affect the asthmatic very differently. As a general rule, perhaps, the air of the crowded city is more congenial, than that of rural and elevated situations. Dr. Watson refers to the case of a college acquaintance of his, who can sleep in one inn in Cambridge, and not in another; and who assured Dr. Watson, that when in Paris, he never escapes a fit of asthma if he attempt to sleep in the back part of Meurice's Hotel, and yet never suffers if he sleep in a front room. A friend of the author—one of the most respectable inhabitants of Baltimore—is unable to sleep at his country-house, which is not more than a mile and a half from the centre of the town. He has tried the experiment frequently, and the result has always been identical. The author knows another gentleman, who cannot sleep with impunity in

the town: others, again, prefer a dry, whilst many breathe more freely in a moist, atmosphere; and the same thing applies to medicinal agents, that are administered in the way of inhalation. An interesting case has been related by Dr. Chapman of Philadelphia, in which the air of different parts of the same house produced very different effects. Called to visit a young lady from the south of the United States, who was labouring under a violent paroxysm of the disease, Dr. Chapman was told that she had derived immunity from it during a previous and recent residence in Paris, by selecting the middle story of an hotel in a particular portion of that city; and that, whenever she quitted the apartment, a paroxysm soon came on, from which she was as speedily relieved on returning to it. Curious to make the experiment, Dr. Chapman was seconded by the patient's own desire, owing to her anxiety to change her lodgings, where she had suffered severely, and in a very short time she went to another house in the vicinity, in which she entirely escaped the disease for several months. Being compelled, however, to leave it, she took up her residence at the distance of a few hundred yards, in a street no less thickly built; and here she had scarcely any exemption for weeks. On moving to a different quarter of the city, Dr. Chapman witnessed a complete verification of the statement she had made. As long as she occupied the chamber on the second floor, she was harassed almost nightly by renewals of attacks, which were prevented by sleeping in the room above. Even by dining below, her respiration was, on several occasions, seriously affected.

Pathological Characters.—It has been already remarked, that the researches of the most eminent pathologists have failed in detecting any morbid appearances, that throw light on the essence of asthma; and that all the phenomena indicate it to be a neurosis of the chest. The spasmodic nature of the disease is now admitted by almost all; the spasm being seated—as it always is—in the nerves, that are distributed to muscular fibres,—in this case, in those surrounding the small bronchial ramifications: that such fibres exist, has been demonstrated by the observation of distinguished anatomists, and even had they not, the phenomena of asthma would have been sufficient proof thereof. It has been supposed, that the bronchial spasm is consecutive on irritation or inflammation of the pulmonary mucous membrane, but this can scarcely be the case in those asthmatics who are affected by slight changes of air, in the manner already described. Others, again, in the apparent obscurity of the subject, have supposed either that the disease is owing to a spasmodic condition of the heart, which prevents the blood from being distributed to the lungs, or that it is always a symptomatic affection of some lesion of the heart or great vessels, whilst others, again, are of opinion that the cause of the phenomena ought to be sought for in the brain and spinal marrow, and not in the heart or lungs. There can be no doubt, that amongst the organic conditions connected with asthma, may be reckoned diseases of the heart; and hence there may be foundation for a *cardiac asthma*. Dr. Billing expresses his total disbelief in the existence of spasmodic asthma as a disease of the muscular structure of the bronchia; and

states that he has never seen a case which, sooner or later, could not be traced to organic disease of some viscus, as the heart, liver, spinal cord, or lungs, such as emphysema, Laënnec's chronic dry catarrh, &c.

All the phenomena of asthma establish, that the disease is dependent upon some special condition of the nerves, which are distributed to the bronchial mucous membrane, and that through them the different nerves connected with the respiratory function become implicated. The attacks generally perhaps result from some internal irritation, either in the lungs, the heart, or the digestive system, producing a reflex action upon the muscular fibres of the bronchial tubes. Under the spasm of the muscular fibres of the bronchia, thus induced, the functions of the membrane itself become disturbed; and, after repeated paroxysms, modifications in the texture of the membrane may be perceptible. The good effects of the narcotic or anti-spasmodic treatment of asthma, are strongly in favour of its neuropathic character. Moreover, according to Dr. Watson, Dr. Williams has demonstrated experimentally, that the lungs and air-tubes are actually contractile, to a very considerable degree, under electrical, chemical, and mechanical stimuli. The contractions take place steadily and deliberately, and are followed, as soon as the stimulus is withdrawn, by an equally gradual relaxation. M. Valentin, too, found that the rings of the trachea could be made to contract visibly and distinctly, by irritating the pneumogastric nerves.

Treatment.—The treatment of asthma—as of every other paroxysmal disease—resolves itself into that which is proper during the paroxysm, and that which is advisable afterwards.

a. *During the paroxysm.*—The patient should be propped up in bed, and every ligature or article of clothing, that could interfere with the circulation, be removed. Air, too, should be freely admitted into the chamber. The great difficulty of breathing, and the apparent urgency of the symptoms, would naturally suggest the use of bloodletting; and when the patient is vigorous and plethoric, it may be practised with advantage. It can only be advised, however, as an antispasmodic. There is no inflammation, it must be recollected, to be subdued; and, therefore, should the practitioner determine upon employing it, he will not consider it advisable to repeat it, but will rather have recourse to other agents, which are found to be effectual, as far as any remedies are so, in removing the paroxysm. Therapeutical agents, which act by inducing a new impression on the nervous system, or by allaying nervous erethism, are those which prove most beneficial. To the first class belong emetics, which have been advised by most therapeutists. As the object is revulsion, those emetics are preferable, which induce nausea, followed by full vomiting; and there is no one more advisable than the tartarized antimony,[a] singly, or in combination with ipecacuanha.[b]

[a] R.—Antim. et potass. tart. gr. iv.
Aquæ f℥iij.—M.
Dose, one half, to be repeated in twenty minutes, should the other not operate.

[b] R.—Antim. et potass. tart. gr. ij.
Ipecac. pulv. gr. xv.—M.

The various agents belonging to the class of emetics have been advised, but none of them possess virtues beyond those of the articles first mentioned. The sulphate of zinc was largely prescribed by Prof. Kuhn, of Philadelphia, who believed it to be possessed of superior "antispasmodic" properties in this, as well as every other, affection of the air-passages of a spasmodic nature; but his view has not been embraced by others. It is obviously, indeed, less adapted for such cases, in consequence of its revellent action being less energetic, by reason of its action as a direct emetic, or one that does not induce much preceding nausea.

The revulsion, effected by stimulating manuluvia and pediluvia, or by sinapisms applied to the wrists, lower extremities, and to the anterior or posterior part of the thorax, has, likewise, yielded relief. M. Ducros, of Marseilles, in a paper laid before the Académie Royale des Sciences, of Paris, states that in nine cases he had found the application of ammonia at 25° (s. g. 905), over that part of the cervical vertebræ, which corresponds to the pharyngeal plexus, arrest the paroxysm almost instantly; and Dr. Graves has found the application of a liniment, which is an imitation of that of St. John Long, of much service.

℞.—Acid. acet. fort. f℥ss.
Ol. Terebinth. f℥iij.
Aquæ rosæ f℥iss.
Ol. Limon. ℥x.
Vitell. ovi q. s. ut fiat mistura.
To be applied by means of a sponge to the nape and sides of the neck, and the forepart of the chest.

It generally induces an eruption of small pimples after a few applications. Benefit has likewise resulted from dry cups applied over the chest; and, as the modification in the circulation, produced by a ligature round the lower limbs, and the new condition thereby engendered, have prevented an attack of epilepsy, the same course has been advised in asthma: cold affusions and aspersions have been used with a similar view by some, and are said to have been of benefit.

Galvanism is a remedy, which has been much extolled, and whose operation must be esteemed essentially revellent. Resting on his views of the absolute identity between the nervous and the galvanic fluids, Dr. Wilson Philip employed galvanism in asthma. In a communication read by him before the Royal Society of London, in January, 1816, he details some experiments which he made on rabbits. The eighth pair or pneumogastric nerves were divided by incisions made in the neck. After the operation, the parsley, which the animals had eaten, remained unchanged in their stomach, and, after evincing much difficulty of breathing, they seemed to die of suffocation. But when on other animals, whose nerves had been divided, the galvanic agency was transmitted along the nerve, below its section, to a disc of silver, placed closely in contact with the skin of the animal, opposite its stomach, no difficulty of breathing occurred. The galvanic action being kept up for twenty-six hours, the rabbits were then killed, and the parsley was found digested. The removal of dyspnœa, in these cases, led Dr. Philip to employ galvanism as a remedy for asthma;

and by transmitting its influence from the nape of the neck to the pit of the stomach, he gave decided relief in every one of twenty-two cases, of which four were in private practice, and eighteen in the Worcester Infirmary. The power employed varied from ten to twenty-five pairs of plates. Since that time, galvanism has been repeatedly used in such cases, but commonly Mansford's plates are employed for this purpose. (*New Remedies*, 5th edit. p. 338, Philad. 1846.) The disease is unquestionably, in the majority of instances, dependent upon erethism of the pneumogastric nerves: all the phenomena exhibit that there is a spastic constriction of the small bronchial tubes, from causes seated at the extremities, or in the course of the nerves. The new impression, made by the galvanic agency, breaks in upon the concentration of nervous action, by exciting other portions of the nervous system, in the same manner as we observe spasms or ordinary cramps relieved, or paroxysmal diseases warded off, by agents that are capable of suddenly impressing some part of the nervous system.

The magnet has been used in similar cases. It was employed in the manner recommended by M. Hallé;—that is, by establishing a magnetic current through the diseased parts, by means of several magnetised plates; and Laënnec affirms, that he frequently found it diminish the oppression.

Of the substances that act by allaying nervous erethism, narcotics hold the first rank; and of these, opiates would naturally first suggest themselves to relieve the paroxysm. Yet there has been much difference of opinion in regard to them;—some extolling them highly, whilst others have recommended caution in their employment, and others again have thought them decidedly prejudicial. The truth is, that the efforts of the practitioner are not attended with very marked success during a paroxysm of asthma; but still much may be done to relieve; and, in this respect, the author has found opiates to hold an elevated rank, when given in full doses, in combination with an agent, which, in appropriate doses, is a nauseant, and, therefore, a relaxant. The *pulvis ipecacuanhæ et opii* is hence an excellent form; or the opiate may be administered along with a diffusible stimulant, and be repeated, unless its effects are perceptible.

℞.—Tinct. opii f℥j
Æther. sulphuric. f℥ij.—M.
Dose, sixty drops, every half hour, until relief is obtained.

Or ℞.—Morph. acetat. gr. ½.
Sp. æther. sulphuric. f℥ss.
Aq. camphor. f℥xi.—M. f. haustus.
To be repeated, if necessary.

Belladonna, hyoscyamus, stramonium, conium, and other narcotics, have been substituted for opium; but, as in every other spasmodic disease, none of them can be so much relied upon. The hydrocyanic acid, even when the pulse was small, irregular, and often not readily distinguishable, is said to have acted in asthma almost like a charm, removing the oppressed breathing, and restoring the free play of the respiratory organs; but such has not been the result of the author's trials with it. It is certainly less efficacious than narcotics.

Both nux vomica and its active principle, strychnia, have been administered in asthma, and, like other excitants of the nervous system,

they may have rendered service, but they are not to be depended upon. The same may be said of the reputed antispasmodics—assafœtida, castor, musk, valerian, &c.,—which are mainly dependent for their virtues on the essential oil they contain, and therefore on the impression which they make on the gustatory nerves, as well as on those of the stomach. Next to narcotics, they are the remedies most frequently employed, during a paroxysm, either alone, combined together, or associated with opium.

R.—Mist. assafœtid. f℥v.
Tinct. opii camphorat. f℥ss.
Sp. ætheris sulphuric. comp. f℥iij.—M.
Dose, a tablespoonful, every half hour.

Towards the end of the paroxysm, it has been advised to administer some of the reputed expectorants—as gum ammoniac, myrrh, polygala senega, &c. Of the reality of any such class of medicinal agents, great doubts may be entertained; but there can be no question, that the demulcent agency of any of the ordinary syrups, combined with the slightly excitant properties, which some of them—as the *syrupus* or *oxymel scillæ*, or the *syrupus senegæ*—possess, may be employed beneficially. No great reliance, however, can be placed on them. The efforts of the practitioner must be directed to the removal of the morbid condition, and, as that yields, the secretion from the bronchial mucous membrane will be restored.

Iodine has been found very efficacious by some observers—as by Drs. Oke, Casey, and others. Dr. Casey gave it in upwards of five and twenty cases; and in no instance, where a fair trial was made, did it fail "to afford unequivocal and decided relief." The dose varied from two to five grains, three times a day.

There is a mode of administering narcotic, and other substances, so as to cause them to come in contact with the seat of the disease, and to afford marked relief in many cases—that is, by *inhalation*. In this way, aqueous vapours, impregnated with narcotic or gently excitant substances, have been received into the air-passages. The leaves of belladonna, hyoscyamus, stramonium, &c., have been boiled in water, and the vapour inhaled into the lungs; but the probability is, that the effects did not differ from those of the vapour of simple water, as the narcotic properties of the plants are not volatile. The inhalation, which promises the most success, is that of the vapour of ether. Ether itself has long been prescribed internally as an antispasmodic in asthma; but Dr. Robert Willis says he has long been familiar with the fact, that it is vastly more efficacious when inhaled. His plan of using it is sufficiently simple. He pours two, three, or four drachms of the fluid upon a clean handkerchief, and directs this to be held close to the mouth and nostrils; a single short and difficult inspiration is scarcely made before the effect is experienced, and he has occasionally seen the paroxysm terminated in six or eight minutes, the respiration having, in this short time, become almost natural.

Chlorine, iodine, iodide of sulphur, tar, and various excitants, have likewise been inhaled in the form of vapour, but there can be few cases in which their employment could be suggested, and more espe-

cially as experience has shown, that more striking benefits result from certain of the narcotics employed in the way of fumigation. The most important of these is stramonium, which was at one time esteemed almost, if not wholly, a specific. It is not entitled to any such reputation, yet it affords eminent relief in many cases. The smoke of tobacco relieves some asthmatics, and aggravates the symptoms of others; but that of stramonium agrees with a large majority of persons, and occasionally affords marked relief. A friend, who suffers excessively under the disease, frequently makes manifest to his medical attendant the relief he derives from its inhalation. For this purpose, he employs the dried stalk. Others use the root; and others, again, the leaves only. A veteran asthmatic, in a letter to a distinguished physician, Dr. Forbes, thus expresses the results of his own experience:—"Smoking, I am able to say, after fifteen years' practice, and suffering as much as mortal can suffer and not die, is the best remedy for asthma, if it can be relieved by expectoration. I have been in the hands of all the doctors of ——— for fifteen years, and still I say, SMOKE!"

It has been proposed to immerse paper in a saturated solution of nitrate of potassa, to dry it, to set fire to a portion of it, and to allow it to burn in the vicinity of the patient. The author has frequently observed good effects from this inhalation, both in asthma, and chronic bronchitis.

At the period when the inhalation of *factitious airs* was supposed to hold out a probable plan of cure for many serious diseases, oxygen was highly extolled in asthma, but no one thinks, at the present day, of employing it, and the same may be said of the proposition to force air into the lungs of the asthmatic through a common bellows. Upon the principle of revulsion, it might be advantageous; but we cannot see how it could act upon any other. Such are the chief therapeutical agencies to be employed during an attack of asthma.

b. *Between the paroxysms.*—In the intervals between the fits, care is demanded to prevent their recurrence. The therapeutical agents, that are advisable, will depend upon the accompanying symptoms. As a general rule, the remedies needed during the paroxysms will be indicated, under various modifications, in the intervals. Attention must be paid to the due maintenance of the functions of the skin, the kidneys, and the alimentary canal; to restore, where practicable, any cutaneous or other irritation, or any accustomed evacuation, provided such have been unduly or suddenly arrested; and, where the attacks observe anything like a regular intermission, to employ the various antiperiodics recommended in intermittents, especially the sulphate of quinia, and arsenic. The main reliance, however, must be placed on hygienic precautions. The patient should breathe the air, which experience has shown to be most congenial to him. Long journeys have often removed the disease; and sea voyages have been especially recommended. So beneficial is the result of travelling, air and exercise, that even the exposure and hardships of military life have proved beneficial. During the late war, when the volunteers of Philadelphia were called out, and encamped for several months—part of the time

in winter,—individuals, according to Dr. Chapman, who had been previously harassed dreadfully by the disease, escaped entirely, whilst thus employed, and have since been nearly exempt from it. The diet should be properly regulated, so that excess in eating and drinking is avoided; regular and moderate exercise must be taken daily; vicissitudes of temperature be guarded against by appropriate clothing, and flannel be always worn next the skin. Frictions with the flesh-brush should be frequently employed, with cold, tepid or warm bathing, where it is not contra-indicated. Frictions with various substances, as cold vinegar and water; liquor ammoniæ acetatis, &c., have been recommended by Dr. Copland, and others, but it is not easily seen on what principle. No advantage can assuredly be induced by these agents beyond what simple friction is capable of affording. No less attention should be paid to preserve perfect tranquillity of mind. By a strict observance of these rules, the paroxysms of asthma may be warded off, and comparative comfort be enjoyed, even when the predisponent cause is powerful.

IX. HICCOUGH.

Synon. Singultus, Lynx, Lygmus, Clonus Singultus, Hiccup, Hickup; *Fr.* Hoquet; *Ger.* Schluchzen, Huck, Schluckauf, Krampf der Zwerchfell.

Hiccough is a convulsive inspiratory movement, accompanied by a peculiar dissyllabic noise, generally recurring repeatedly at very short intervals, and at times occasioning unpleasant succussions of the thoracic and abdominal organs. It is not an easy matter to explain its physiology. Generally, it is referred to an involuntary and sudden spasmodic contraction of the diaphragm, and to the instantaneous and noisy introduction of air into the lungs through the narrowed aperture of the glottis,—an incomplete inspiration followed immediately by a natural expiration. By some, it has been attributed to a spasmodic movement of the stomach: others have assigned it to a convulsive contraction of the œsophagus, dragging upwards the stomach and the diaphragm, whilst the diaphragm is at the same time drawn downwards by a sudden contraction. It is probable, however, that the phenomena are referable chiefly to the respiratory muscles, especially the diaphragm, which are capable of being thrown into spasmodic action by impressions made on the stomach.

Hiccough may be idiopathic or symptomatic. In the former case, it at times persists so long as to fatigue and annoy the patient more than can be expressed. Generally, however, it is transient, and requires little or no attention. This is especially the case in infants, who are very subject to it. It rarely occurs to any distressing degree, or so as to require the attention of the physician, except in unusually impressible individuals,—in other words, in those who, either naturally, or in an acquired manner, are endowed with nervous systems of great susceptibility. One of the most distressing cases that have fallen under the author's care occurred to a gentleman who had been in the habit of drinking freely, and had been several times affected with delirium tremens.

The most common immediate cause of hiccough is some impression made upon the stomach, as by very hot or highly-seasoned

food, especially in a liquid form, or swallowed too hastily; and when it has been induced a few times it is very apt to recur from habit.

Symptomatic hiccough is frequently an inconvenient and often a dangerous symptom. It is especially observed in cerebral affections, in peritonitis, enteritis, dysentery, strangulation of the intestines, &c., and in almost all these cases it is of unfavourable omen. Singly, it is not indicative of danger; but when accompanied by other grave phenomena, it is of serious import.

Treatment.—In a common case of hiccough, nothing is demanded. It commonly disappears of itself. Any sudden emotion, as a fright, or anger; holding the breath as long as possible; drinking slowly, and without breathing, an acid or iced drink, will often stop it at once; but in more obstinate cases, agents that make a new and powerful impression on the nervous system may be demanded, as ether, musk, assafœtida, castor, emetics, cupping, sinapisms, electricity, galvanism, electro-magnetism, or even the actual cautery. Occasionally, it will cease most capriciously on the exhibition of agents from which no such effect could have been anticipated. In one case—that of an eminent statesman—which had resisted every antispasmodic, narcotic and revulsive agency, the spasmodic action ceased immediately on the internal use of a syrup of bullaces.

Should the affection recur periodically, it must be met by the use of antiperiodics, especially the sulphate of quinia.

X. MORBID PRODUCTIONS OF THE LUNGS.

The morbid productions met with in the lungs may be, as elsewhere, either *analogous*,—that is, similar to those met with in the healthy condition of the body,—or *heterologous*,—having no analogy in the economy. Notwithstanding the advanced state of diagnosis in modern times, it is not easy,—indeed, often not practicable,—to distinguish them from each other.

When morbid productions are of trifling size, they may give rise to no sign that can reveal their existence; and when more developed, although their presence may be detected, it is frequently impossible to discriminate as to the precise mode of their production. For example, tubercles in the lungs, when disseminated, may give rise to no local phenomena; but if agglomerated, the signs, afforded by percussion and auscultation, may sufficiently diagnosticate their presence. The same remark is applicable to other morbid formations, yet it may be extremely difficult to detect the precise morbid production which gives rise to the phenomena.

a. *Cancer of the Lung.*

Synon Carcinoma seu Scirrhus seu Fungus pulmonum, Pneumophthisis carcinosa, Cancerous phthisis (*Bayle*,) Medullary or Encephaloid Tumour of the Lung; *Fr.* Cancer du Poumon, Phthisie carcinomateuse; *Ger.* Lungenkrebs, Markschwamm der Lungen, Krebsige Lungenschwärsucht, Krebsige Phthisis.

This disease is by no means common, yet it is occasionally met with; and, difficult as the task is, has been diagnosticated during life.

Diagnosis.—If the patient present signs of chronic disease of the lungs, with the general evidences of the cancerous diathesis, and espe-

cially if there be concomitant cancer of some other portion of the body, there may be but little doubt of the existence of cancer of the lung. It may be divided, with Dr. Stokes, into cases in which simple degeneration occurs without change of volume, and into those in which tumours exist, that cause compression and displacement. In the first class, the physical diagnosis is difficult; in the second, the signs may be those only of some internal tumour. It has been properly remarked, however, that as intrathoracic tumours are in general either aneurismal or cancerous, the diagnosis will be between these forms of disease. There are no physical signs peculiar to this affection, but the evidences of gradual diminution, and ultimate subsidence of vesicular murmur, with the tracheal respiration, resonance of the voice, and complete dulness on percussion, without the precursory signs of pneumonia, pleurisy, or tubercle, will justify a suspicion of the existence of the cancerous degeneration without change of volume. On the other hand, where cancerous tumours exist, that cause compression and displacement, there may be, as in aneurism, localized dulness, double pulsation, with bellows' sound, difference of the radial pulses, tracheal breathing, dysphagia, palpitation and pain in the shoulder; but the feebleness of pulsation, connected with the extent of dulness, may assist in distinguishing the disease from aneurism. Such are the main diagnostic evidences laid down by one, who has paid much attention to the subject. The author has not met with any case, and, therefore, cannot speak from experience. Dr. Stokes adds, that though the existence of external cancer may often aid in diagnosis, yet the disease may be altogether internal; or the visceral may precede the external cancer. M. Andral affirms, that he has never found cancer of the lung without its existing elsewhere at the same time.

When the cancer has attained the stage of softening, it gives occasion to hectic fever and emaciation; and the straw—and, at times, livid—colour is an index, so far as it goes, of the nature of the affection. Lancinating pains in the chest have been enumerated amongst the signs of the disease; but, according to some, although such pains are regular concomitants of cancerous affections of certain parts, they have never been observed in cancer of the lung. In one case, mentioned by M. Bayle, a pain was experienced, similar to that induced by compressing the testicle.

Causes.—They are those of cancer in general. The lesion is gradually formed, and often without any evidences of bronchitis or pneumonia; and, frequently, the lung remains entirely healthy around the cancerous masses. The first symptoms appear, at times, after the removal of a cancerous tumour. Time of life seems, as in cancer of other parts, to exert an influence. It has been generally observed between the ages of 25 and 70. Of nine cases, in which the ages were noted, it was found, according to M. Andral, to have occurred at the following ages:—25, 35, 37, 48, 49, 55, 57, 58, and 72. It would seem to be incomparably more frequent in males than in females. Of 22 cases collected by M. Hasse, 5 were in women, and 17 in men. Of these 22 cases 9 occurred between the 20th and 29th years; 8 be-

tween the 30th and 39th; 2 between the 40th and 49th; 2 between the 50th and 59th; and 1 between the 70th and 79th years.

Pathological Characters.—Two forms of cancer are found on dissection. In the *first*, one or more cancerous masses, of different size and shape, and enveloped or not in a cyst, are found in the substance of the lungs. These masses can be readily removed, when the pulmonary parenchyma surrounding them may be found unaffected. They are generally encephaloid in their character. In the *second*, a portion of the lung is transformed into a scirrhous production. This may implicate one lobe of the lung only, or a whole lung.

Treatment.—It is obvious, that if the disease be diagnosticated, no treatment can eradicate it. The efforts of the practitioner must be limited to palliation.

b. *Melanosis of the Lung.*

Synon. Nigritudo seu Carcinoma melanbticum seu Melansis seu Melanoma seu Anthracosis pulmonum, Melanopneumon, Pseudomelanosis of the lung; *Fr.* Mélanose pulmonaire; *Ger.* Melanose der Lungen, Infiltration mit schwarzer Lungenmaterie, Schwarzsucht der Lungen.

This black matter, which is not unfrequently met with in the lungs at an advanced period of life, either in the interlobular tissue, or in the parietes of the vesicles, has received more attention from the morbid anatomist than from the therapeutist; or, to employ the language of M. Rostan, its anatomical characters have attracted the attention of pathologists much more than its functional expression.

Diagnosis.—There are no symptoms that can diagnosticate this from other morbid conditions of the lung of a chronic character. They are affirmed, indeed, on good authority,—that of M. Andral,—to be identical with those of chronic pneumonia; and a form of phthisis has been described, and termed *melanic*, by Bayle.

Causes.—They are very obscure. It has been said, that it may be produced by breathing the vapour of oil and coal in combustion, constituting, when it implicates the whole lung, what has been called the *black lung of coal miners*, and, recently, *anthracosis*. Melanosis of the lung is observed, however, in all conditions and in every way of life, and in the country as well as in the city. It is often seen in the lungs of horses,—and in white horses, it is affirmed by M. Dupuy, oftener than in others. The recent observations of M. Guillot show, that the deposit is really of a carbonaceous nature. It is almost peculiar to old age, is rarely or never met with in infancy and youth; and is usually not discoverable until about the middle period of life. At first, it has the appearance—under the microscope—of a very fine black powder sprinkled through the transparent substance of the pulmonary tissue. This powder is found to be constituted by the assemblage of excessively minute granules, separated more or less completely from each other—the intervals between them becoming less and less as the amount of the deposit increases. The particles appear to be impervious to light, for even under a high magnifying power they seem as intensely black as when observed with the naked eye.

Pathological Characters.—Melanosis of the lung cannot be mistaken. At an early period it is liquid, and may infiltrate the parenchyma of

the lung, which may be healthy, or indurated. The melanotic formation may be isolated or encysted; and it generally exists, at the same time, in other organs,—as the liver, the spleen, the brain, &c. It is commonly found in irregular masses, in small nodules, in thin, irregular plates, or in minute points. The tuberiform variety,—*Melanomyces* [?], *Melanospongus*—occurs in globular, oval, or pyriform, tumours, from the size of a currant to that of an egg or even a large apple. The surface of the tumours is either smooth, irregular, lobulated or studded with small tubercles, like a mulberry. Of this variety, two or three examples only have been seen by Dr. Gross. The author has met with several of the amorphous kind. A case is related by M. Andral, of a man, fifty-nine years of age, in whom the left lung was wholly converted into a black, homogeneous substance, of such density, that the scalpel could scarcely penetrate it. The whole appeared like a mass of extravasated black injection after it has cooled.

Some writers have divided the different kinds of true melanosis—*melanosis vera*—into four classes;—*Melanosis punctiformis, M. tuberiformis, M. stratiformis*, &c., but all divisions, founded on form only, are of course arbitrary.

Melanosis—M. Andral affirms—may be confounded with the bronchial glands or ganglions. The latter are, however, small and close to the bronchia; their outer surface is very smooth, and their interior rarely presents a very uniform black colour. The fluid which oozes out from them, scarcely colours the finger, whilst melanosis always gives the skin the tint of Indian ink.

Treatment.—As we have no means of diagnosticating this affection, it is of course impracticable to lay down any precise rules of treatment.

c. *Serous Cysts and Hydatids in the Lung.*

Synon. *Fr.* Kystes séreux, et Hydatides du Poumon.

A question may occasionally arise as to whether the cystiform productions found at times, although rarely, in the lungs, are of the acephalocystic kind, or mere serous cysts. The author has elsewhere stated, that the evidences of the animalcular nature of the former—wherever met with—are by no means overwhelming; and that, on the other hand, there is great reason for believing in their being nothing more than cysts containing a limpid fluid.

Diagnosis.—If the cysts or hydatids be in small number, and occupy a limited space, or if they be accompanied by acute pneumonia, or any other pulmonary disease, the symptoms may be very obscure. The only pathognomonic evidence of the presence of acephalocysts in the lungs is their appearance in the expectoration; yet, in such cases, it is not easy to believe, that they were formed in the pulmonary parenchyma. It has been affirmed, indeed, that hydatids, originating in the liver, have been discharged by the lungs, and been tinged with bile. The physical signs are like those of other morbid growths. If the cysts be few in number, the sounds afforded by percussion and auscultation may be those of health; if more numerous, and therefore

occupying a larger surface of the lung, the sounds may indicate some extraneous deposition, but they can afford no information as to its precise character. In one case, in which a dull sound was rendered on percussing the inferior part of the chest, a large pouch, according to M. Andral, was found in each inferior lobe of the lung, which was filled with hydatids.

Pathological Characters.—The seat of hydatids is generally in the parenchyma of one or both lungs. They have, however, been found in the pulmonary blood-vessels, as well as in pouches communicating with the bronchia, or with the cavity of the pleura. Their size varies. Generally, they are small, but, at times, as large as the fist, and occupying a whole lobe. They have been attributed to inflammation, but, as M. Andral has properly remarked, this is altogether hypothetical, and explains nothing. Their cause is, indeed, wholly unknown. They have been supposed, by Dr. Baron, to be the source of all tubercular affections of the lungs, but this is liable to the same observations as the last hypothesis. Certain it is, that they are very rarely met with in the human subject. Of nearly 6000 patients, admitted into the wards of M. Lerminier in six years, hydatids were seen in the lungs only five times. In one of these instances, they were found in the pulmonary veins; but in all the others they were developed in the pulmonary parenchyma.

Treatment.—As we have rarely any pathognomonic evidence of the presence of serous cysts or hydatids in the lungs, we can seldom be called upon to treat the affection; were we, indeed, aware of their presence, it would not be easy to offer anything satisfactory. In one case, the expectoration of the hydatids appeared to be promoted by the inhalation of the vapour of ether.

The practitioner will have to inquire into the condition of the general and local symptoms, and to lay down his indications accordingly.

d. *Calcareous Concretions in the Lung.*

Synon. Pulmones tartarizati, Lithiasis pulmonum; *Fr.* Calculs Pulmonaires; *Ger.* Steine in den Lungen, Lungensteine, Verirdung in der Lungen.

These are by no means uncommon. Every pathologist must have freqently met with them, and often on the dissection of those who have died of other diseases. A recent writer, M. C. Rogée, affirms, that in the lungs of 100 old women, whom he examined, he found cretaceous or calcareous tubercles in 51. The author has frequently seen the lungs studded with them, yet there may not have been any signs, that indicated their presence during life, at least immediately preceding dissolution. Perhaps, in all cases, they are transformed tubercles, and certainly a transformation, as remarked by M. Andral, the very opposite to that of softening. They have, indeed, been properly regarded by MM. Papavoine, Rilliet and Barthez, Boudet and Lebert as a form of natural cure of tubercles; and MM. Rilliet and Barthez remark, that several acute diseases, and especially typhoid fever, small-pox, and scarlatina are capable, during infancy, of provoking the cretaceous transformation of tubercles, and thus of curing tuberculous affections when not too extensive. When analyzed, these concretions have been

found, according to Dr. Marshall Hall, to consist of 3 parts of animal, and 97 parts of saline matter; the saline matter consisting almost entirely of phosphate of lime, with some carbonate of lime and carbonate of magnesia. M. Boudet, however, found, that besides a small quantity of phosphate and of carbonate of lime, the cretaceous matter consisted mainly of chloride of sodium and sulphate of soda, to which M. Lebert adds cholesterine. They are of different degrees of consistence,—sometimes hard, at others soft, like particles of plaster softened in water. Their colour, size, and number likewise vary. When accompanied by the ordinary signs of pulmonary consumption, they constitute the *Calculous Phthisis*, *Phthisis calculosa*, of Bayle.

These concretions are almost always found at the top of the lung. Of fifty-one cases, noted by M. C. Rogée, in thirty-nine they were either at the apex exclusively—or in much greater number than in the rest of the organ; in six, they were equally distributed over the whole lung; and in six, they were found in several parts, without being at the top. Twenty-four times, they were found in both lungs simultaneously; seventeen times in the right lung, and ten times in the left.

Diagnosis.—The only certain evidence of the existence of pulmonary calculi, in any case, is their presence in the expectorated matters; yet, it has been properly remarked, that this circumstance is not sufficient to discriminate, whether they proceed from the lungs, the bronchia, or the bronchial ganglions.

Treatment.—The remarks made on the treatment of serous cysts and hydatids are equally applicable here. We have no pathognomonic signs of their presence in the lungs, and if we had, it is not easy to lay down any plan of management that would lead to their removal.

e. *Tubercles in the Lungs.*

Synon. Tubercula, Tuberculosis seu Strumosis seu Phymatosis Pulmonum, Pneumophymata, Tuberculization of the Lungs; *Fr.* Tubercules Pulmonaires; *Ger.* Lungentuberkeln, Lungenknoten.

The presence of tubercles in the lungs gives rise to pulmonary consumption; yet tubercles of the lung and pulmonary consumption cannot be regarded as synonymous, inasmuch as tubercles may unquestionably exist there, and remain quiescent, so that no symptoms of pulmonary consumption may present themselves. Still, these latter cases must be regarded as exceptions, and therefore it may be convenient, with the generality of writers, to inquire, under this head, into the phenomena of pulmonary consumption.

The word "phthisis," (from φθίω, "I dry up," "I fade,") like consumption, means emaciation and decline from any cause. Hence, in the older writers, and, indeed, in the more modern, we meet with *laryngeal*, *pulmonary*, *gastric*, *hepatic*, *intestinal*, *splenic*, and *renal* phthisis, to designate, respectively, the marasmus, which is produced by disease of the larynx, stomach, liver, spleen, and kidney. In more modern periods, the term *phthisis* has been applied to diseases of the lungs only, and by one writer on this subject, M. Bayle, as many species of phthisis are laid down, as there are organic lesions, which, in his opinion, could, by their development, lead to wasting and death. Hence, he has the *tubercular*, the *granular*, the *cancerous*, the *mela-*

notic or *melanic*, the *calculous*, and the *ulcerous*. Since the period, however, of the distinguished introducer of stethoscopy, Laënnec, pathologists have generally admitted but one species of phthisis, the *tubercular*, and have considered that the existence of tubercles of the lungs constitutes the proper character of phthisis. Perhaps it may be well to include under the term all those forms of disease of the lungs, which arise from the formation of tuberculous matter, or of depositions and indurations, which are allied to it, in the substance of the lung.

To give a correct view of this important morbid condition, it will be advisable to inquire, first of all, into the pathology of tubercle.

1. TUBERCLE.

It has been properly remarked by Dr. Marshall Hall, that, after inflammation, tubercle is the most important of the subjects comprised in the theory of medicine or pathology. It is important, therefore, to inquire into the pathological characters it presents in the lungs, which constitute, essentially, the pathological anatomy of pulmonary consumption.

Pulmonary tubercles—as remarked by M. Andral—present three distinct periods in their existence—one of development or crudity; one of elimination or softening; and one of excavation or cavern.

1. *Period of development or crudity.*—Tubercle, in the simplest and most common form, is a small, yellowish-white body, of a round shape, firm consistence, and sufficiently hard to be crushed in many cases; in others, of the consistence of viscid pus, or cheese. It varies in size from that of a millet-seed, to that of a pea or nut. It is without any trace of organization or texture; is sometimes isolated; at others agglomerated in masses of greater or less dimension; sometimes infiltrated into the parenchyma of the lungs, and occupying one or more lobules,—at others, a lobe, or even the whole lung. Tubercles are very rarely single or solitary; and their number varies greatly. They are commonly situate at the top of the lung, and when they are met with in the inferior lobes, they are always in a less advanced stage of existence than those of the superior lobes.

Various opinions have been entertained in regard to the primitive state of tubercle. It has been presumed to commence by small, transparent, shining grains or granulations, of variable size, from that of a millet-seed to that of a grain of hemp, which have been called *miliary granulations*. Such is the opinion of different distinguished pathologists. It has, however, been combated, on the ground that if the granulations be the first stage of tubercle, they ought to be met with wherever tubercles exist, which is not the case. They are seen only in the pulmonary tissue. Andral regards them to be formed of the pulmonary vesicles, indurated and hypertrophied, and constituting one of the anatomical forms of pneumonia—the *vesicular*. Others have considered the tubercle, at its commencement, to be nothing more than a particle of fibrine resulting from a trifling oozing of blood; whilst others, again, have assigned them a hydatid origin; but this opinion has been embraced by few, although, in animals, hydatids and tuber-

cles have been found in the same organs by Cruveilhier, and even depôts of tubercular matter are affirmed by MM. Dupuy and Andral to have been found in animals in hydatid cysts. M. Rokitansky, however —according to two of his pupils—maintains, that tuberculosis and serous cysts are never met with simultaneously in the same organ, or even in the same individual; but where one process has entirely ceased, the other may develope itself. M. Sebastian corroborates M. Rokitansky's views, by observing, that hydatids are never found in the same organ as tubercles. M. Rokitansky considers that tubercles occur in the lungs originally in two forms,—the one named by him the interstitial tubercular granulation, and the other the tuberculous infiltration. The *former* is the most common form of tuberculous deposition. It consists of the well-known round, grayish bodies, found discrete, or agglomerated and scattered through the parenchyma of the lungs. Their seat is in the interstitial tissue, between the smaller lobuli and the cells of the lungs, and on the walls of the cells themselves. The *latter* form of tubercles is the result of a process identical with common pneumonia, except that the lymph, which is deposited in the cells, instead of being absorbed or running into pus, becomes, from the influence of the tuberculous diathesis, yellow tuberculous matter—thus constituting hepatisation by means of a tuberculous product. This form is considered by M. Rokitansky to be always the result of a very high degree of tubercular diathesis,—occurring most generally in young persons, being usually attended with tuberculosis of the bronchial glands, and often with bronchial tubercles; appearing seldom as primitive tuberculosis, and coming on usually in the far-advanced stages of interstitial tubercles.

Whenever tubercle is met with, it is in the solid state. Yet it cannot be presumed to have been separated from the blood-vessels in this form. It is probably more fluid when first deposited, and afterwards the fluid portions are taken up by absorption; but how this is effected, we know not. The researches of recent histologists appear to show—in the language of Gerber—that albuminous or unorganized tubercles can only be produced from exudations abounding in albumen and poor in fibrin; and such exudations, it need scarcely be said, are more likely to occur from blood which possesses less of the plastic or fibrinous material. Hence, the important practical indication—to modify the condition of the circulating fluid by improving its plastic or vitalizing power.

Ordinary tubercles, according to M. Thénard, consist of about 98 parts of animal, and 2 parts of saline matter, comprising chloride of sodium, and phosphate, and carbonate of lime. They have been analyzed also by Berzelius, Dulong, Abercrombie, Lombard, Lassaigne, Hecht, Preuss, Boudet, Scherer, Lehmann, Vogel, Cozzi, Glover, Güterbock, Scharlau, Simon, and others; yet, respecting their chemical composition, nothing can be regarded as definitely established. All that we can say, according to M. Vogel, is, that tubercular matter consists principally of a protein compound. Of the calcareous tubercles, mention has already been made, (p. 370.)

The precise location of tubercle has been a great question among

pathologists, and one on which difference of sentiment yet exists. Whilst some have believed them to be seated in the lymphatic system of the respiratory apparatus; others have referred them to the pulmonary vesicles, and minute bronchial tubes. Some, again, have presumed them to be secreted from the bronchial mucous membrane; whilst others have referred them principally to the cellular membrane of organs. The author has frequently investigated this point, and has satisfied himself, that the submucous seat of the tubercle was manifest in several cases. It is obvious, however, that other textures, besides the cellular membrane, may secrete tuberculous matter, for we find it deposited at the surface of the mucous lining of the air-passages, in the bronchia; in the vesicles; in the cellular texture, which unites the different parts of the lungs; and in the lymphatic vessels of the lungs. When deposited, and as we ordinarily see it, it would appear to be, like the cuticle, completely anorganic, having at times, although very rarely, a cyst. Appearances of blood-vessels are sometimes seen; but these, it is affirmed, are owing to a portion of the pulmonary parenchyma having become incarcerated, when the tubercles, which were at first isolated, joined and became agglomerated, as no trace of a vessel has been met with in a simple tubercle. It has likewise been a question with pathologists, as to the mode in which the tubercles become developed. Some have presumed, that the matter of tubercle is endowed with plastic properties, so that it increases from within, in the manner of organized and living bodies—that is, by intussusception; but the tubercles—whatever size they may attain—never exhibit any traces of organization. The fresh deposition doubtless occurs in the same manner as that of the primary tubercle, and increase of size takes place by accretion. The tubercles gradually become agglomerated, so that the intervening tissues are incarcerated and compressed, and as vessels were distributed through these tissues, evidences of them appear on dissection. At times, however, they become confounded into one mass, in which nothing but tubercular matter is perceptible.

The minute texture of tubercle has been lately examined with care by numerous observers, and, amongst others, by Mr. Gulliver, who considers it to be composed of granular matter, corpuscles, and cells. The granular matter is seldom or never absent, and is composed of infinitely minute particles, and of minute spherules remarkably variable in magnitude, and generally from the $\frac{1}{3000}$th to the $\frac{1}{8000}$th of an inch in diameter. This is the most prevalent ingredient of tubercle. It is almost always mixed with the other constituents, and frequently forms the entire mass of caseous tubercle. The corpuscles are more generally more or less globular or oval, but are often either very irregular in form, or shapeless. They generally vary from the $\frac{1}{8000}$th to the $\frac{1}{2000}$th of an inch in diameter, and are thought by Mr. Gulliver to be, probably, imperfect, degenerating, or blighted cells, and nuclei. The most common size of the cells is from the $\frac{1}{2600}$th to the $\frac{1}{1110}$th of an inch in diameter. They may be frequently recognised in grayish miliary tubercles; but as the tubercles increase in size, the well-marked and complete cells disappear,—probably, according to Mr. Gulliver,

degenerating into the corpuscles and granular matter. From all his histological observations, Mr. Gulliver thinks it highly probable, that tubercle, like the most highly organized tissues, has its origin in cells, generally mixed at a very early period with granular matter. It seems, however, to differ essentially from the matter of plastic exudations, inasmuch as the cells of the latter not only grow into a higher organization, but increase also in number towards the centre: in other words, plastic matter has an inherent power of multiplying and evolving organic germs; but tubercle has no such power; for it would appear, that its primitive cells can only retrograde and degenerate, since they are wholly destitute of the plastic force—or, to use the language of Dr. C. J. B. Williams, are aplastic from the beginning. The semi-transparent, miliary, gray, and tough yellow forms of tubercle have some traces of organization, but they undergo no further development. They are cacoplastic products. The opaque, crude, or yellow tubercle has no signs of definite structure. It is completely aplastic. Histologically, according to M. Vogel, it is difficult—indeed frequently quite impossible—to distinguish the tubercular deposit from the scrofulous and the typhous. M. Lebert, however, in whose observations M. Louis has great confidence, as he has cited him in the second edition of his "Researches on Phthisis," is of opinion that tubercle can always be easily diagnosticated (?); but as a microscope magnifying as high as 500 diameters and a practised eye are needed for this purpose, the diagnosis can rarely—granting M. Lebert's assertion to be correct—be available. "Tubercles," says M. Lebert, in his communication to M. Louis,—and he repeats the statement, but in different language, in his recent work, entitled "*Physiologie Pathologique*," Paris, 1845, p. 351—"contain a great quantity of molecular globules, varying in diameter from $\frac{1}{16}\frac{1}{00}$th to $\frac{1}{8}\frac{1}{00}$th of a line, ($\frac{1}{8}\frac{1}{00}$th to $\frac{1}{4}\frac{1}{00}$th of a millimeter,) a hyaline substance, which unites their elements, and a species of corpuscle, which gives them a peculiar character. These corpuscles are of irregular, angular form, varying in diameter from $\frac{1}{2}\frac{1}{00}$th to $\frac{1}{3}\frac{1}{00}$th of a line, ($\frac{1}{1}\frac{1}{00}$th to $\frac{1}{1}\frac{1}{50}$th of a millimeter,) and, generally speaking, present a well-defined edge. Their interior is yellowish-coloured, slightly opaline, and often contains molecular granules distributed through its substance. They never contain true nuclei, which are so common in cancerous globules and so constant in those of pus. Acetic acid, which renders the latter transparent, and displays nuclei within them in a very distinct manner, renders the tuberculous corpuscle also more transparent, without disclosing true nuclei in it. If enough water be added to the tuberculous corpuscles to make them float, their form is discovered to approach that of an irregularly polyhedral sphere, instead of being flattened like the globules of pus or cancer. They are so numerous, generally speaking, and present so many superimposed layers in the best microscopical preparations, that it is necessary to have observed them repeatedly, and with a clearly defining magnifying power of from four to five hundred diameters, in order to acquire an accurate notion of their characters, and enable the observer to detect them in all tubercles."

In the sputa of a man who laboured under phthisis and pneumothorax, Dr. H. Bennett found a cryptogamic plant growing, which continued to become developed in the tubercular matter after the removal of the lungs from the body, as well as in the matter discharged before death by expectoration. The plant resembled the *Penicillum glaucum* of Link.

2. *Period of elimination or softening.*—After the tubercles have remained crude for a longer or shorter period, they undergo important changes, and ultimately become softened. The mode, in which the softening is effected, has been a matter of dispute; some believing, that they possess, within themselves, the power of softening, as they do of development; others attributing it to an inflammatory process; but the most probable view is, that the tubercles act as foreign bodies, irritating the surrounding tissues, and occasioning a secretion of pus, which softens the tuberculous matter mechanically. When the mollescence of the tubercle has taken place, the tuberculous matter seeks to escape; this gives rise to the

3. *Period of excavation or cavern;*—the stage, in other words, of ulceration. The pus makes its way into the bronchial tubes in the same manner as that of an ordinary abscess makes its way to the surface. The pulmonary parenchyma, surrounding the tuberculous matter, as well as the bronchial tubes themselves, becomes destroyed; and a ready exit is thus afforded to the matter, which is thrown out by expectoration. The excavations or caverns are owing to the simultaneous softening of several tubercles agglomerated together, or of one large tubercle; as well as to the destruction of the pulmonary parenchyma by ulceration, and the expectoration of the softened tuberculous matter. The number of cavities in the lung is extremely various. At times, there are several; at others, but one or two; these are always surrounded, in greater or less number, by tubercles in different stages of their progress, which, by becoming successively softened, add to the size of the cavities already existing, or form new ones.

On the dissection of lungs that are largely tuberculated, sufficient evidence is afforded, that the cavities are formed in the manner described. They are usually found divided into compartments by extensions of the pulmonary parenchyma, forming bands or cords, which pass from one side of the cavity to the other, and which break at times, so that the divided extremities hang loose in the cavity. In other cases, as in one which the author has just examined, large vessels are seen crossing the cavities, which do not appear, however, to be capable of conveying blood, but to have become obliterated; sometimes, before they are rendered impervious by disease, the vessels give way, and death takes place by hæmoptysis, and at times—although rarely—almost instantaneously, the hemorrhage being so excessive. The seat of the excavations is generally in the superior lobe, where the tubercles are commonly most numerous. At times. they so completely destroy the pulmonary parenchyma, that the exterior paries may be formed by the pleura pulmonalis only. The contents of the cavities are various. They commonly consist of a mixture of pus, mucus, and tuberculous matter, and, at times, blood; and, occasionally, portions of the pulmo-

nary parenchyma are observed in the sputa. In a case, which the author had under his care recently, this was manifestly the fact. In the case, before alluded to, the fluid was thin and sanious, and of an offensive character. At times, indeed, gangrenous sloughs form in the parietes of the caverns, so as to complicate the phthisis with gangrene of the lungs. Occasionally, the caverns are found quite empty, but this is uncommon. It is important, also, to bear in mind, that the cavern may contain a greater quantity of pus at one time than another; and, at times, may be so completely filled, that, as regards the physical signs afforded by the voice alone, no positive deduction can be made; whilst, at other periods, and of the same day, especially in the morning, the caverns may be so far emptied by expectoration, that the vocal signs of a cavern may be very unequivocal.

The interior of the cavern may consist of the pulmonary parenchyma indurated, red, and infiltrated with tubercular matter, the surface being irregular, and projections and prolongations existing, which are formed either of condensed cellular substance, or of the remains of vessels, as before described. In their shape,—as has been correctly remarked by Professor Gross,—these small fasciculi or bundles bear a very close resemblance to the fleshy columns of the heart, and they are often encrusted with yellowish tuberculous matter. It rarely happens, that any remains of bronchial tubes exist in them. It would seem, that the slight pressure, made by these heterologous formations on the tubes, is sufficient to cause their absorption. Generally, however, bronchial tubes are seen to terminate in them, through which the tubercular matter, pus, &c., are expectorated, and the presence of which affords signs of moment to the auscultator. Occasionally, a communication exists between the cavern and the cavity of the pleura, giving rise to pleuritis, or pneumothorax; or a fistulous opening may exist, by which the matter may make its exit by the parietes of the thorax. Frequently, the excavations, especially if old, are lined by a whitish false membrane, thin, soft, and friable, or adherent, and formed of various layers.

The following particulars of the necroscopy of a case of tubercular phthisis, which fell under the author's care in the Philadelphia Hospital, and was reported in the *American Medical Intelligencer*, 1838–39, p. 201, by an intelligent resident physician, Dr. Vedder, now of Schenectady, exhibit the characters frequently presented by tubercular caverns on the dissection of those who have died of phthisis. The left lung was adherent throughout, and was removed with the greatest difficulty; on separating it, a large cavity was opened, which discharged about a pint of dark fluid blood. The pleura pulmonalis anteriorly was three-eighths of an inch in thickness, hard, and almost cartilaginous. On cutting into it, the scalpel passed immediately into a large anfractuous cavity, occupying the whole of the superior, and about one-half of the lower, lobe: numerous firm bands traversed it in all directions, (obliterated blood-vessels;) two or three were of a light red colour, and—as it were—dissected out; they were still permeable; a probe could be passed into them. An imperfect, almost cartilaginous, septum existed, which could, with difficulty, be cut by

the scissors; it was constituted apparently by the pleura, which dipped between the lobes. Numerous small cavities communicated with the large cavern: these varied in size from that of an almond to that of a pullet's egg. The large, and nearly all the small, cavities were lined by an old and polished membrane. Numerous bronchial tubes terminated abruptly in the cavity; these appeared as if cut off, and varied in size from that of a pipe-stem to double the size. One was about half an inch in diameter. On the anterior surface of the lung was an opening, which communicated with the cavity. It was evidently old, from the character of its margins, which were smooth, rounded, firm, and shining. The lung was, however, so firmly bound down in this place, as to have prevented the passage of air into the cavity of the pleura. One mass of tubercles was met with in the lung, of about the size of an egg. A small portion of the base of the lung still preserved its vesicular texture, crepitated, and was engorged with blood. This was the only portion of the lung in which the vesicular structure was not destroyed. In the right lung, there were a few scattering nuclei of tubercles; and in the posterior part of the upper lobe there was a small cavity lined with a smooth membrane. The bronchial glands were tuberculous.

It has been a prevalent opinion, that when once a cavern has formed in the lungs, it is incapable of cicatrization; and Dr. Chapman, of Philadelphia, has pronounced the opposite opinion to be an illusion. One of the most distinguished of modern pathologists, M. Louis, has affirmed, that, in the numerous dissections which he has made, he has never met with a single example. His negative experience, has, however, been controverted by the positive observation of others. The author has met with several instances, in which this change was unequivocally accomplished; and the details of the case of an eminent medical practitioner in this city. Dr. Parrish, have been published, in whose lungs there were marked evidences of cicatrization. This probably occurred after he had long suffered under symptoms of phthisis, and exposed himself to a regimen, as will be mentioned hereafter. M. Boudet affirmed before the *Académie Royale des Sciences*, of Paris, that in 197 cases taken indiscriminately, he found 10 examples of cavern completely cicatrized, without any trace of recent tubercles; and 8 examples of complete, or partial cure of cavern, coinciding with recent tubercles; and he concludes, that recovery is possible at any period of pulmonary consumption. His researches would seem to show, that tubercles of the lungs are common when no suspicion is entertained of their existence. Of the 197 persons, who died in the hospitals of various diseases, or were killed suddenly by accidents, he detected tubercles in the lungs of one—a child under 2 years of age; from this age to that of 15, tubercles were present in three-fourths of the cases; and in those between 15 and 76, no fewer than six-sevenths of the bodies exhibited the tubercular deposit in the lung. These results are explained by M. Boudet by the facility with which tubercles undergo a change in their intimate constitution, by which they become not incompatible with a state of health. These modes of cure, according to him, consist of sequestration, induration, absorption, and elimination,

—which supervene spontaneously. Observers are every day discovering appearances on dissection, which can only be referred to the existence of tubercular deposits at a former period. Of 73 bodies examined by Dr. H. Bennett, between November 1844 and April 1845, he found puckerings or concretions in 28; in 12 of these, indurations alone existed; and in 16, calcareous concretions were also present. In 100 bodies examined by M. Rogée at La Salpêtrière, these lesions were discovered in 51, or more than one half. M. Boudet also states, that of 135 bodies examined by him, he found them in 116, or in about four-fifths of the whole number. Dr. Hughes arrives at the startling conclusion, from his own observations, and those of MM. Rogée and Boudet, that the spontaneous cure of tubercle has occurred in from one-third to one-half of all who die after forty. "So deeply rooted, however," he adds, "is the opinion of the necessarily fatal nature of this disease, that, simply because recovery has taken place in certain cases, medical men have rather mistrusted their own diagnosis than ventured to oppose a dogma of universal belief."

The mode, in which this cicatrization is accomplished, appears to be as follows:—At times, the cavern exists, but it becomes lined with a membrane of a cellulo-vascular character, approaching the serous membranes in its nature and functions. This may be regarded as the completion of the process of reparation; for no more tuberculous matter or pus is poured into the cavern. By degrees, this cavern diminishes in size, and, in process of time, may form a mere line with cellulo-fibrous parietes, in which large bronchia suddenly terminate. The contraction of the parietes of the cavern gives occasion to a puckering of the lung, which is often most strongly marked on the apex, where the contraction of the cellular parietes of the cavern have drawn it strongly downwards, and the pleura pulmonalis along with it. In the depression, pseudo-membranous flakes are thrown out, which subsequently become converted into fibrous, or fibro-cartilaginous, tissue. M. Louis considers "the sort of cartilaginous cap covering the apex of the lung when excavated" to be a pleuritic lesion peculiar to phthisis.

M. Fournet, whilst he admits that pulmonary phthisis is, in extremely rarely cases, susceptible of cure in the stage of excavation, considers it to be by no means demonstrated, that the cure depends upon complete cicatrization of the excavations; nor is the mode—he maintains—in which the cure is effected yet understood, although he thinks it more likely to be by conversion of the excavations into fistulæ, than by their closure.

That tubercles are capable of what may be esteemed a cure, in their period of crudity, is shown by the results of all observation. They may, under appropriate treatment, remain quiescent, or they may become converted into those calcareous concretions, which, as has been elsewhere shown, are met with in the lungs, on the dissection of persons who have died of disease in other organs. It has been properly remarked by M. Andral, that the cicatrization of the lungs must not be confounded with the phenomena that result from dilatation of the bronchia, or with the puckering and sinking down of the

lungs, observed in old people, in whom these organs tend to become atrophied.

Whilst the tubercles are in a crude state, the pulmonary parenchyma surrounding them commonly appears unchanged; but when the stage of softening is in progress, and especially when caverns have formed, it is subjected to material modifications. Generally, evidences of inflammatory action, which may be acute, but is more commonly chronic, are perceptible around the tubercular masses. At times, pneumonia exists along with tubercles, so as to give rise to the interesting question, whether the pneumonia gave origin to the tubercles, or conversely? The author's view—as will be seen hereafter—is, that whilst the formation of tubercles may be excited by inflammation, they are not necessarily dependent upon it; and, consequently, as a general rule, if pneumonia be found, it must be esteemed either an accidental complication, or the result of the presence of tubercles.

It had been long observed, that tubercles are often developed in many organs at the same time, and that, in the consumptive especially, they are met with in other parts than the lungs. Numerical results have been obtained, however, in recent times only. Of 358 necroscopies of persons who had died of phthisis, the presence of tubercles, or of tuberculous matter, according to M. Louis, was observed in

The lungs, in *all the cases* except one.	
Small intestine, in nearly one-third.	
Large intestine, in one-ninth.	
Mesenteric gland, in one-fourth.	
Cervical glands, in one-tenth.	
Lumbar glands, in one-twelfth.	
Prostate, in one-thirteenth.	
Spleen, in one-twentieth.	
Ovaries, do. do.	
Kidneys, in one-fortieth.	
Uterus,	In one only.
Brain,	
Cerebellum,	
Medulla oblongata,	
Ureters,	

It is, therefore, in the lungs only, that tubercles exist alone; and in but one of the 358 subjects were there tubercles in any organ without their being at the same time in the lungs. In a report made to the *Académie Royale de Médecine*, of Paris, on M. Louis's Researches on Phthisis, M. Chomel, the reporter, asks whether these numerical results will apply to infants? To establish this, investigations have been instituted, which have led to the following observations. In 100 *adult* subjects, noted by M. Lombard, who had died of phthisis, tubercles were found;—in the intestines, 26 times; in the mesenteric glands, 19 times; bronchial glands, 9 times; cervical glands, 7; spleen, 6; lumbar glands, and the subperitoneal cellular tissue, 4; axillary glands, and anterior mediastinum, 3; subarachnoid cellular tissue, spinal marrow, false membranes of the pleura and peritoneum, intercostal muscles, and ovaries, 2 each; gall-bladder, liver, posterior mediastinum, pleura, vertebræ, omentum, uterus, prostate, bladder,

cerebrum and cerebellum, medulla oblongata, kidneys and vesiculæ seminales, 1 each. On the other hand, in 100 cases of phthisis in *infants*, recorded by the same observer, tubercles were found;—in the bronchial glands, 87 times; in the lungs, 73, (30 times in one lung only,—13 times in the left, 17 in the right); in the mesenteric glands, 31; spleen, 25; kidneys, 11; intestines, 9; brain, 9; cervical glands, 7; meninges of the encephalon, 6; pancreas, gastrohepatic glands, [?] cellular tissue lining the peritoneum, 5; inguinal glands, 3; cellular tissue lining the pleuræ, 2; lumbar glands, bladder, omentum, gall-bladder and false membranes covering the pleura, 1 each. MM. Rilliet and Barthez give the following table of the comparative frequency of tuberculous depositions in different organs in 314 children.

Lungs,	265	Liver,	71
Bronchial ganglions,	249	Large intestine,	60
Mesenteric "	144	Meninges of the brain,	52
Small intestines,	134	Kidneys,	49
Pleura,	109	Brain,	37
Spleen,	107	Stomach,	21
Peritoneum,	86	Pericardium, heart,	10

From these observations, as well as those of Dr. P. Hennis Green, it is evident, that the distribution of tubercles differs greatly in children and in adults; that they exist in children in a greater number of organs at once, and are not so invariably present in the lungs. In infants, it will be observed, they occur more frequently in the bronchial glands than in the lungs, a fact which has been observed, although rarely, in the adult. They preponderate, also, strikingly in the brain and meninges. The following table exhibits a parallel between adult and infantile phthisis, in regard to the frequency with which other organs besides the lungs are implicated in tuberculous disease. It is formed by a recent writer (*Brit. and For. Med. Rev.*, July, 1845, p. 98) from the results of the observations of M. Louis, and of Dr. P. Hennis Green.

	ADULT. (Observed by Louis.)	CHILD. (Observed by Green).
Tubercles in		
Brain or membranes,	$\frac{1}{3\,5\,8}$ of the cases.	$\frac{1}{9}$ of the cases.
Bronchial gland,	$\frac{1}{5}$ "	$\frac{1}{1\,1\,2}$ "
Mesenteric glands,	$\frac{1}{5}$ "	$\frac{1}{2}$ "
Liver,	$\frac{1}{1\,7\,9}$ "	$\frac{1}{9}$ "
Kidneys,	$\frac{1}{3\,4}$ "	$\frac{1}{1\,8}$ "
Ulcerations in		
Larynx,	$\frac{1}{4}$ "	$\frac{1}{1\,1\,2}$ "
Bowels,	$\frac{5}{6}$ "	$\frac{1}{7}$ "

The researches of M. Louis have led him to the inference, that after the age of 15, tuberculous matter is never met with in any tissue or organ, unless it exists also in the lungs; at least he has known only two exceptions.

The common opinion is, that the left lung is more frequently and extensively affected with tubercles than the right, but such has not been the result of the author's observation, nor does it accord with that of many other individuals. High authority, that of M. Louis, has been

brought forward in favour of the left lung being most frequently and extensively affected, and it is supported by some observers on this side the Atlantic: but a writer in the *British and Foreign Medical Review*, for April, 1840, has shown, that, curiously enough, the cases of M. Louis do not, on analysis, warrant his inference, the following being the result in his 50 tuberculous subjects.

Cavities in both lungs in 33 cases.	Most extensive in right lung in	13
	" left "	12
	Doubtful in this respect,	8
Cavity in left lung only,		7
" right "		6
Tubercles (without ulceration) predominating on the	Right side,	1
	Left,	1
	Doubtful on which,	2
		50

Both lungs seem, therefore, to have suffered as closely as possible to the same amount. In the records of 250 cases, investigated by Dr. Hughes, it would appear, that the left lung was chiefly diseased in 116, and the right in 89. The upper lobe of one or both lungs was solely or principally diseased in 237, or 95 per cent. Of 170 cases, observed by another pathologist, M. Fournet, 109 presented the greatest share of disease on the right side; 46 on the left; and in 15 cases both sides were equally implicated. If any doubt, however, exists during life as to which of the lungs is more frequently and extensively affected with tubercles, it must be admitted to be unusual to find the disease equally developed on both sides.

The observations of M. Rokitansky, of Vienna, have led him to infer, that tuberculosis and cholera are incompatible. In the cholera epidemics in Vienna, it was remarked, that in the very numerous dissections which were made, no case of cholera was found combined with tuberculosis, yet although this incompatibility existed between tuberculosis and cholera, his observations afforded no ground for the belief, that diseases of the lungs in general give any such immunity. He observed, also, that the coincidence between tuberculosis and typhus, and between the former and dysentery, carcinoma, serous cysts, aneurism, hypertrophy of the heart, dilated bronchia, and almost all chronic diseases of the stomach, was extremely rare. Several years ago, the attention of Dr. J. B. S. Jackson, of Boston, was directed to the subject of the infrequency of tubercular deposition in patients dying from malignant disease, without his being aware, for some time, that the same remark had been made by others. Of 33 cases of malignant disease, in nearly all of which a careful examination was made for tubercles, in 24 none were found; six times they were observed in the lungs alone, and three times in the bronchial glands alone. M. Lebert, however, denies, that tubercles and cancer mutually exclude each other. He has not only seen the two diseases together in the same individual, but has satisfied himself, that the one in no respect arrested the progress of the other.

2. TUBERCULAR CONSUMPTION.

Synon. Phthisis pulmonalis, Ph. pulmonaris, Ph. pulmonalis vera seu tuberculosa seu ulcerata seu tuberculosa seu scrophulosa, Ph. pulmonalis purulenta exulcerata, Marasmus Phthisis, Hæmoptysis Phthisis, Tuberculosis seu Tabes Pulmonum, Pneumopathia seu Pneumophthisis tuberculosa, Tuberculous Disease of the Lung, Pulmonary consumption, Consumption of the lungs, Consumption, Decline; *Fr.* Phthisie pulmonaire, Crachement de Pus; *Ger.* Lungenschwindsucht Knotige Lungenschwindsucht, Tuberkelschwindsucht, Tuberculöse Lungensucht, Knotige Lungenschwärsucht, Lungentuberculose.

The preceding remarks on tubercles—as occurring in the lungs more especially—will render the symptoms of tubercular pulmonary consumption readily intelligible. There is no disease which is more deeply interesting to the pathologist—affecting, as it does, the young and the promising, and being so fatal—so alarmingly fatal—when once it has become fully developed.

It is an old estimate, that perhaps one-ninth part of the whole number of deaths is from pulmonary consumption. In Great Britain, the proportion has been conceived to be one-fifth, and according to Sir James Clark, it has even been rated as high as one-third of the whole number; but the latter estimate, according to Dr. Forbes, is too high for England, as it probably is for any part of the United States. The third report of the Registrar-General enables us to judge with some degree of accuracy of the ratio of deaths from consumption in England and Wales, in the year 1839. Of 90,565 deaths referred to diseases of the respiratory organs, 59,559, or 18 per cent. of the whole number of deaths, were by consumption. From medical works in various languages, and from statistical tables published by various authors, Dr. Casper, of Berlin, has recently constructed a table, which refers to the period of twenty or thirty years prior to 1842, and comprises upwards of 60,000 deaths from phthisis, among different populations in the great cities of this country and elsewhere. From this it appears that, on the average, *one death in six* occurs from the disease under consideration.

An estimate, as already remarked, has been attempted by Dr. Emerson, of the average mortality from consumption and acute diseases of the lungs, in the four largest cities of this Union—New York, Philadelphia, Baltimore and Boston,—from which it would appear, that the average annual proportion of the general mortality to the population, was, in New York, 1 in 39·36; in Boston, 1 in 44·93; in Philadelphia, 1 in 47·86; and in Baltimore, 1 in 39·17; and that the average of the mortality from consumption alone to the general mortality was in New York, 1 in 5·23; in Boston, 1 in 5·54; in Philadelphia, 1 in 6·38; and in Baltimore, 1 in 6·21. The subject has since been investigated by Professor Hayward of Boston, who has found, that whilst Philadelphia has suffered less from consumption than New York or Boston during the last 30 years,—the average of deaths from that disease being 1 in 7·003 of the whole number, whilst, in Boston, it was as 1 in 6·185, and in New York, as 1 in 5·547,—during the last 10 years Boston has enjoyed the greatest exemption. From 1831 to 1840 inclusive, the deaths in Boston from consumption were 1 in 7·587; in Philadelphia, 1 in 7·482; and in New York, 1 in 5·952. The report of the then City Inspector of New York, Dr. Griscom, for 1842

is, however, more favourable to that city. It makes the proportions of deaths from phthisis to the whole number, omitting still-births and casualties, to be 1 in 6·114. Yet, notwithstanding these statistical evidences, it has been affirmed by a recent writer, whose opinions may have weight with many, that Philadelphia is greatly exempt from this scourge when compared with certain other cities. "It is on the littoral boundaries of our northeastern territories," says Dr. Chapman, "that it prevails; and greatly, in New York, Newport, and Boston. As we advance southerly, and particularly receding from the ocean, it sensibly diminishes. The native population of this city is nearly exempt from the disease, and the fact is important, as showing the influence of locality. Equally remote from the sea and the mountains, it comparatively escapes from the austere winds of the one and the cold blasts of the other, maintaining a more regular and moderate temperature than the latitude of its position would seem to warrant. That our bills of mortality exhibit a number of deaths from the disease cannot be denied. But most of these are negroes and foreigners—and it must also be known, that all chronic pectoral affections are reported with little discrimination under the title of consumption. It is at least a fact, that in the whole circle of my acquaintance, wide and intimate as it is, there is hardly an indigenous family who has the phthisical taint, or who for years has lost a member by this disease."

Such, certainly, has not been the result of the author's experience, except in the Philadelphia Hospital, where, for obvious reasons, the proportion of foreigners is large. In private practice, the greater number of phthisical cases that have fallen under his notice has occurred amongst the "native population." Moreover, the negroes—who fall victims to it in great number—are "indigenous" in as large a proportion, perhaps, as the whites who inhabit Philadelphia.

The mean proportion of deaths from phthisis at Carlisle, London, Plymouth, and the Landsend, is stated by Dr. Forbes, to be one in 5·6. In New York, during 1839, the ratio was one in 5·2, excluding casualties and the still-born; and one in 6 including those. In Philadelphia, during the same year, according to the Report of the Board of Health, the ratio was one to 7·2, of the whole number of deaths. These estimates must, however, be regarded as approximations merely, inasmuch as the same method of obtaining the statistics was not adopted in the different places.

Diagnosis.—The symptoms of tubercular consumption admit of a division—in accordance with the progress of the tubercles—into three stages;—the *first* being that of tubercular development; the *second*, that of softening; and the *third*, that of the formation of large caverns in the lung. Between the different stages—as has been well remarked by Dr. Stokes—there is no exact line of demarcation, but when completely established, each has its characteristic symptoms, and physical signs.

First stage.—It is proper to state, that although a certain group of symptoms may accompany tuberculous disease of the lungs, the order in which these present themselves, and the degree of their severity,

vary remarkably in different individuals,—in some cases, the symptoms being so pronounced as to excite the attention of the most careless observer, whilst in others they are so trivial as scarcely to be noticed by any but the medical attendant, and occasionally not even by him. In this first stage, the symptoms are mainly those of catarrh, —as cough, some dyspnœa, languor, debility, with at times, in addition, hectic fever, followed by unaccountable emaciation. The cough exhibits great variety, but it is commonly slight, frequent and irritating, and is referred to a tickling sensation in the trachea. The expectoration, when there is any, consists of a nearly transparent mucus,— at times, containing small dots of blood. Along with these symptoms, pain in some part of the thorax is often experienced, at times constant, but at others intermittent, and occasionally so regularly intermittent, that, as it has occurred with the paroxysms of hectic, it has been mistaken for intermittent fever, and treated accordingly. This pain often occupies the scapulo-humeral articulation, and is accompanied with tenderness of the subclavicular region, and often with irritation of the muscular fibres, which causes their contraction on percussion. The combination of this pain of the shoulder with quickness of pulse, it has been affirmed by Dr. Stokes, should always excite alarm. The pathological condition of the lungs consists in the presence of a greater or less quantity of tuberculous matter,—the whole, or a large proportion of which, is in a state of crudity,—that is, more or less firm, of a grayish colour and somewhat transparent; or partly of a pale yellowish colour and opaque. The pulmonary tissue, and bronchial membranes, in the immediate vicinity of the tuberculous deposits, may have undergone no perceptible alteration, or may present a degree of redness and vascularity.

At this period of the disease, the physical signs are not as valuable as they are afterwards, unless the tubercles are numerous, and seated —as, by the way, they generally are—near the summit of one of the lungs. Inspection of the chest may convey little or no information, but, according to Dr. Walshe, Dr. Chambers has observed an enlargement in the antero-posterior diameter of the summit of the chest, doubtless owing to the increase in the size of the lung, produced by the tuberculous formations. Under such circumstances, the sound, rendered on the percussion of the affected side, will be more dull under the clavicle; the respiratory murmur, on auscultation, will be less full and free; inspiration may be bronchial or jerking—the *respiration saccadée* of the French observers—and this last the author regards as one of the most important signs, especially when taken in conjunction with others; expiration more audible and prolonged, and the resonance of the voice and the vocal fremitus greater; but unless these indications are unequivocally different on the two sides, they cannot, as a general rule, be much relied upon at this early period, as a means of diagnosis. From the facts, however, analyzed by M. Louis, and referred to elsewhere, (p. 231) he infers that slightly prolonged expiration at the upper part of the right side of the chest is, of itself, of little value as a diagnostic sign of phthisis; and that it is much more significant on the left side. All these signs are evidences of deposition at

the upper portion of the lung. The sound of the voice, transmitted by the induration in an unusual degree, is sometimes only a diffused resanance. The subjacent arteries are also heard unusually clear below the clavicles; and in cases of tuberculous deposition in the upper portion of the right lung, the sounds of the heart are often heard more loudly in this situation than under the left clavicle. When the subclavian arteries are heard with unusual distinctness, it is owing to a partial obstruction of the arteries by the pressure of indurations at the apex of the lung. This has been esteemed a sign of incipient phthisis, but it cannot be diagnostic, as the same sounds are produced in some healthy persons under slight excitement, probably, as suggested by Dr. C. J. B. Williams, owing to the artery pressing on the clavicle or upper rib.

Second stage.—In this stage the diagnosis becomes more marked. The hectic glow and fever are more evident; the symptoms of irritation continue; the emaciation and loss of strength make decided progress; the hectic chill in the evening, succeeded by fever, is followed by sweats, more or less profuse; the colourless, frothy expectoration, which had previously attended the cough, is observed to contain small specks of opaque matter, of a pale yellowish or white colour, and resembling curds or cheese. The proportion of this matter gradually increases so as to form patches, surrounded by the transparent portion in which they seem to float, or they fall to the bottom of water, if the sputa have been expectorated into it. Specks or streaks of blood are also perceptible in them, and, at times, hæmoptysis occurs to a considerable amount. There is occasionally, in this stage, less oppression or pain in the chest than before; but the shortness of breath, on exertion, is undiminished, if not increased, and the pains which existed in the chest, in the first stage, are continued. Anomalous pains are apt to occur both in this and the next stage, in different parts of the body, which add greatly to the distress. In a case, which the author attended some time ago, the most severe neuralgic pains were frequently experienced over the chest, abdomen, and extremities, even at the tips of the fingers, which nothing but opiates would allay; and in one unfortunate case, the pain experienced in the occipital portion of the scalp was almost beyond endurance. This is the period of the softening of the tubercles. They have become *broken down*, or are rendered soft by a secretion from the surrounding pulmonary tissue; and the matter, of which they are constituted, passes into the bronchial tubes. About this period, adhesive inflammation generally unites the pleura costalis to the pleura pulmonalis, and the pains experienced in the corresponding parts of the chest are often evidences of the slight pleuritic affection, which precedes, and is the cause of the union. At other times, the pains are of the neuralgic character just referred to. The dulness on percussion persists, and generally extends over a greater surface downwards. Auscultation now becomes a valuable diagnostic agency; vesicular respiration is no longer audible in certain portions of the lung, whilst the respiration along the larger bronchia may be unusually loud; the mucous, the crepitant or sub-crepitant rhonchi or *râles* are heard—the latter, when the patient coughs, more especially. The re-

sonance of the voice is great over the affected parts, and distinct pectoriloquy may be detected, particularly in some portion of the clavicular or scapular regions; but this is not generally audible, unless the cavities are large and empty. The cavernous respiration and voice are indistinct, when the ulcerations are small. These signs will be heard more markedly on one side than on the other, and this difference is an important element in the diagnosis.

It is proper to remark, that the tubercular deposition and development may have proceeded to the extent of rendering the greater portion of the upper lobes impervious to air, and of solidifying those lobes considerably; yet, as Dr. Graves has remarked, the solidified portions may be so divided from each other by laminæ of healthy lung, and may be so covered by a stratum of vesicular tissue, that the general result of percussion is to elicit a clear sound over the whole of the parietes of the chest corresponding to the affected lobes.

The duration of this stage is extremely various; at times, a few weeks; at others, months, and even years. In a very small number of cases, a curative process is established, by which the effects of the disease are, in a greater or less degree, obliterated; and, if the patient's general health be maintained in a good state, there may be no return of tuberculous disease.

Third stage.—This is the stage in which large caverns exist in the lungs, and which has been termed the *colliquative*, in consequence of the wasting induced by the profuse perspirations, which are often attended by diarrhœa. The expectoration is usually very copious. It is not always easy, however, to diagnosticate, in all cases, the purulent sputa from the mucous,—nor is it so important, since the mode of exploration, proposed by Laënnec, has led us to a more accurate diagnosis without it. It is proper also to bear in mind, that the lining membrane of the bronchia can, and frequently does, secrete a purulent or muco-purulent fluid, without there being any tubercular condition of the pulmonary substance. In a case of measles, which fell under the author's care some time ago, and which was accompanied by severe bronchitis, with evident narrowness of the bronchial tubes, a copious expectoration of a fluid possessing all the properties assigned to the matter of vomica, was discharged, which would doubtless have led to the belief, that an abscess had formed in the lungs, had it not been that the secretion was established soon after the commencement of the bronchitis, and that there was an absence of all the physical signs that indicate the existence of a cavity in these organs. The case terminated fatally, and dissection proved that the whole secretion was bronchial. Before tubercles are softened, and their contents discharged into the bronchia, the whole of the matter of expectoration must be supplied by the bronchial mucous membrane. At this time, the sputa —as already remarked—are generally transparent, frothy and tenacious—of the character which is considered *mucous*, but the appearance of the expectorated matter varies materially, and, as in cases of chronic bronchitis, it may become thicker, less frothy, and possess a more equivocal character. Still, the mucous portion will generally

predominate so much, that if the sputa be thrown into water, they will swim, buoyed up, more or less, by the imprisoned air.

When the tubercles become softened, and the tuberculous matter passes into the bronchial tubes, the sputa may still consist largely of the bronchial secretion. The bronchial mucous membrane would seem, indeed, to produce the greater part of the sputa in tubercular diseases of the lungs, and not merely the mucous sputa but the purulent. Dr. Stokes states his conviction, that the contents of cavities are but rarely expectorated, and he regards the pus of phthisis as the result of a vicarious secretion from the bronchial tubes, precisely as he looks upon the purulent expectoration, synchronous with the disappearance of an empyema, and with the absorption of an hepatic abscess, as the product of vicarious bronchial secretion. If the sputa be now examined, they will present the white curdy appearances described as belonging to the second stage of tuberculous consumption. Some of these will be observed at the bottom of the vessel, whilst others are connected with, and suspended by, the more mucous portion. In the stage, now under consideration, when the purulent discharge is very great, it may have the appearance of globular masses, often of an ash colour: these masses predominate greatly over the bronchial secretion, and being usually of greater specific gravity, and less penetrated by the air, they sink in water to the bottom of the vessel. In making these examinations of the matter of expectoration, it is important not to permit too long a time to elapse, after it has been discharged, as the water in the vessel is apt to commingle with it, and thus to create confusion; and likewise to examine more particularly that which is expectorated on first waking, as, in this way, we obtain the secretion which has accumulated in the cavity during the night. After all, however, when we reflect on the varying character of the expectoration, the uncertainty of its changes according to the progress of the disease, and its occasional absence altogether, we ought not to place too much reliance upon it as a diagnostic symptom, especially in the early stages. In conjunction with other symptoms, as suggested by Sir James Clark, it may enable us to ascertain the presence of tubercular disease in complicated cases, and the changes that occur in the ordinary progress of phthisis. It would be highly important, both in this disease and in chronic bronchitis, were we always able to distinguish between pus and mucus; and hence observers have paid much attention to the subject. Perhaps—as M. Simon has observed—the following conclusions are all that we are able to deduce from their observations. *First.* Pure mucus floats on water for a considerable time, if air bubbles be entangled with it. Pure pus sinks rapidly to the bottom: purulent mucus swims if it contains air bubbles, but allows the pus to deposit itself—the deposit frequently taking place in the form of pendant fibres. If pure mucus contains no air-bubbles, it sinks. *Secondly.* Pure mucus lying in water, appears as a homogeneous, streaked, vesicular, viscid, and tenacious mass, of a whitish-yellow colour, and yielding readily to pressure. Pure pus forms a stratum at the bottom of water, of a white, or greenish-yellow colour, and sometimes tinged with blood: by agitation, it is diffused through the

water, and in a short time again sinks to the bottom. Purulent mucus forms streaked, vesicular, often discoloured masses, or mucous sediments: they are easily diffused through water, and have a granular, nonhomogeneous appearance. *Thirdly.* Pure mucus imparts no albumen or mucin to water; mucus, which is mixed with much saliva, does, however, render water, a little albuminous: pure pus communicates a large amount of albumen to water, and purulent mucus imparts a quantity of albumen proportionate to the amount of pus.

It is impossible, according to M. Donné, to distinguish pus from mucus by means of the microscopic character of their globules, moreover, in the sputa of tubercular consumption, they are always associated.

Along with the generally copious expectoration in the third stage, the dyspnœa often becomes urgent, so as occasionally to threaten suffocation, and the feet and ankles are at times œdematous. Inspection of the chest indicates, that great changes have taken place in that cavity. The shoulders are raised, and brought forward; the clavicles are unusually prominent, leaving a deep hollow—more or less perceptible in the first and second stages—between them and the upper ribs; and the chest, instead of being round, is flat. The shoulders are raised at each inspiration, and the chest is dragged upwards, as it were, in place of being expanded as in health. Percussion gives a dull sound, wherever there is solidification, but if it be practised over a cavity, the sound may not be as dull as in the second stage. Auscultation indicates. that there is no respiration in different parts of the lung—none that is vesicular; but the bronchial or tubal respiration may be uncommonly loud, so as even to be *tracheal* or *cavernous.* Coughing gives rise to a gurgling—*gargouillement*—and sometimes this gurgling is heard on inspiration; and pectoriloquy may be more or less distinct—especially in the morning early, after the pus, which has collected during the night in the caverns, has been evacuated. In this state—hopeless as it is—the patient may linger for weeks or months, or he may be cut off with very slight warning. In a case, which fell under the author's care not long ago, the symptoms in the morning indicated but little augmentation of mischief, yet, in the evening, the dyspnœa increased, and in a few hours the sufferings of the patient were terminated. Such cases are not uncommon. Often, the disease destroys by gradually wearing out the sufferer by a hidden, and not distressing irritation; but, at other times, the sufferings are considerable, and, not uncommonly, death occurs suddenly, owing to the breaking of a vomica in the lungs, the matter of which cannot be evacuated with sufficient rapidity in the enfeebled state of the patient, and death occurs from asphyxia.

The urine varies with the progress of the disease, and the degree of accompanying fever. M. Simon observed in the majority of cases, that after the febrile symptoms became continuous, it assumed the inflammatory type. It was not so deeply coloured as at the height of acute inflammation, but was of a yellowish-brown colour; had a tolerably acid reaction, and was above, or at any rate at, the usual specific gravity. In the early stages of the disease, it did not differ much

either in colour, density, or acidity from the normal secretion. After hæmoptysis, it was generally turbid, and, for the first day or two, threw down slight sediments of urate of ammonia. It afterwards became pale and clear, continued acid, and gradually returned to its normal state. When the febrile symptoms had become continuous, and the colliquative stage had fairly commenced, he found the urine approximate, in its condition, the urine of inflammation. The increase in the quantity of uric acid was noticed by MM. Becquerel and Schönlein as well as by M. Simon.

Such are the main functional phenomena and physical signs of phthisis. It must be borne in mind, however, that valuable as are the latter, when taken along with the former, none of them are pathognomonic; and that all of them, as remarked by Dr. H. M. Hughes, derive their diagnostic importance from a comparison instituted between one part of a lung with another part of the same, or a corresponding part of the opposite lung. It occasionally, but rarely, happens, that tubercles are simultaneously deposited throughout both lungs, or in corresponding parts of both; but under such circumstances no other signs may be presented than those of bronchitis.

Although tubercular consumption must be esteemed essentially the same disease, as regards its anatomical characters and constitutional origin, it has been thought proper to make different varieties of it. Laënnec, for example, recognises five:—1. Regular manifest phthisis. 2. Irregular manifest phthisis. 3. Latent phthisis. 4. Acute phthisis. And 5. Chronic phthisis. Sir James Clark, also, notices five; whilst Dr. Stokes admits six, besides those that are diversified by complications. 1. Acute non-suppurative. 2. Acute suppurative. 3. Chronic progressive. 4. Chronic ulceration following pneumonia. 5. Tubercle consequent on chronic bronchitis. 6. Tubercle consequent on the cure of empyema. It is doubtful, however, whether, as a general rule, more harm than good do not result from such subdivisions. It is not easy, indeed, for any agreement to exist among pathologists in the number of the varieties to be admitted. Accordingly, a recent writer, Dr. C. J. B. Williams, considers it to be sufficient for his purpose to distinguish two kinds of consumption, the *acute* and the *chronic*, without, however, professing, that the line between them is always well marked; and admitting, that each may present considerable variety in its predominant symptoms. In addition to these two varieties admitted by Dr. Williams, Sir James Clark has—the *phthisis of infancy* and *childhood;* the *febrile phthisis*, differing from the others in being usually ushered in, and attended, during its whole progress, by a considerable degree of fever,—and the *latent*. The last—the latent variety—may present itself in two different forms. In one, the constitutional symptoms exist,—as fever, night-sweats, emaciation, diarrhœa, &c., without any local indications of the pulmonary disease, or, if they be present, they are of so slight a character as to pass unnoticed. The other form is more insidious, and, therefore, more important; being attended with neither constitutional nor local symptoms until the tuberculosis has made extensive progress. The greater number of cases may, however, be esteemed latent in the commencement. This opinion

Laënnec was led to entertain, in consequence of finding, that nothing was more common than to meet with numerous miliary tubercles in lungs otherwise healthy, and in persons who had never exhibited any signs of pulmonary consumption; and it has been already remarked, that the lungs may be studded with calcareous tubercles without any existing evidences of phthisis. After Laënnec was first led to adopt this opinion, on anatomical grounds, it frequently appeared to him quite clear, from a careful comparison of the history of the case with the appearances on dissection, that the greater number of the first attacks had been mistaken for slight colds; whilst others were altogether latent, being unaccompanied by either cough or expectoration, or indeed by any symptom of sufficient weight to impress the memory of the patient. These facts, which are confirmed by the results of the author's observation, lead to the important therapeutical deduction, that where there is reason to suspect the existence of a tuberculous diathesis, the greatest attention should be paid to those indications, in order to preserve the pulmonary tissue from more serious inroads.

After phthisis has undergone some degree of development, the symptoms may almost wholly disappear, or become latent under new conditions of the system. Pregnancy is one of these; but it occasionally happens, that symptoms of phthisis make their appearance, for the first time, during utero-gestation, and that difficulty arises in determining, whether the pulmonic symptoms be induced by the development of sympathies irradiating from, or connected with, the uterine condition, or whether they be truly phthisical in their character. The physical evidences of auscultation are present in such a case. M. Louis's own observation has not placed him in a condition to determine whether pregnancy is, or is not, capable of retarding the progress of phthisis. He considers, that a very large number of cases —perhaps even sustained observation for a considerable number of years, in an establishment for the reception of pregnant women—would be required in order to justify any positive assertion on the subject. An attack of mania will often suspend the symptoms of phthisis; the new state of excitation of the nervous system concentering the morbid action on it, and thus diverting from the organic mischief in the lungs. In the course of the disease, the sexual appetite is often greatly augmented; yet, according to M. Rayer, the sperm contained in the several vesicles has been found to contain few or no spermatic animalcules.

Of the particular symptoms of phthisis—the cough, dyspnœa, expectoration, hæmoptysis, pain of the chest, pulse, hectic fever, perspirations, thirst, diarrhœa, emaciation, œdema, aphthæ, &c., not much need be said; yet a few remarks may be advisable on some that have not received, thus far, much notice.

Hæmoptysis is a very common occurrence, having been observed fifty-seven times in eighty-seven cases:—that is, in two-thirds:—in twelve cases only, it preceded the cough and expectoration, and in four cases only it took place in the last days of existence. Of hæmoptysis, mention has been made already. It was then stated to be an affection of but little consequence, except when accompanied by the

presence of tubercles, or of tuberculous excavations in the lungs; but, in such cases, it is a symptom of serious import. In the phthisis of infancy and childhood it is rarely seen. It may, however, occur and not be detected, in consequence of the child swallowing the effused blood.

The *pulse* varies, of course, materially throughout the disease, being rapid during the hectic paroxysms; but often natural in the intervals. Frequently, however,—especially in the more acute forms of the disease,—it is permanently rapid, and almost always so in the advanced periods. Sometimes, even in the third stage, it remains slow. Great attention has been paid to the pulse in phthisis by Dr. Guy, and he has maintained:—1. That its frequency varies within wide limits,—the difference between the extremes amounting to 90 beats. 2. In the same individual, the frequency of the pulse undergoes remarkable fluctuations, passing, in a few days, through a range of upwards of 60 beats. 3. In five out of six cases, the frequency of the pulse in phthisis, exceeds the highest frequency observed in health. 4. The difference between standing and sitting in phthisis, is nearly the same for all frequencies of the pulse. 5. The maximum difference between standing and sitting in all cases of phthisis falls short of the mean difference in health. 6. From the average results of a considerable number of cases it appears, that the mean difference in health is six times as great as the mean, and three times as great as the maximum difference in phthisis. 7. On the supposition, that the slight effect produced by change of posture is peculiar to phthisis, it forms one of the most constant and certain of its symptoms. These results, however, require farther observation. There may be other diseases, which exhibit the same, so that they may not be diagnostic of phthisis.

The *heat* of phthisis, according to Sir Charles Scudamore, reaches from 99° to 104°; and in some instances of acute phthisis, hectic fever being extremely urgent, he has marked it as high as 105°.

Along with phthisis of the lungs, the larynx, trachea, epiglottis, and bronchia, are often the seat of ulceration. *Hoarseness* or *loss of voice* is frequently, indeed, an early symptom of phthisis. From the statistical information, comprised in the last edition of Louis on Phthisis, it appears, that of 190 observed cases, there were ulcerations of the trachea in 76; of 193 cases, ulcerations of the larynx in 63; of 134 cases, ulcerations of the epiglottis in 35: and of 49 cases, ulcerations of the bronchia in 22. These lesions were found much more frequently in males than in females;—why, it is impossible to say. The digestive system also suffers sooner or later, and at the latter periods, more or less endoenteritis frequently prevails, which passes on to the state of ulceration, often complicated with tuberculous deposition under the mucous membranes of the intestines. In some instances, however, phthisis runs through all its stages to a fatal termination, without the supervention of any intestinal disorder. Of 112 cases, observed by M. Louis, 5 escaped diarrhœa. Tubercles, likewise, may form in the brain or spinal marrow, or in the meninges, and give rise to encephalic symptoms. In the female, the catamenia, according to Laënnec, are

generally defective, or absent, at an early stage, and their suppression has been regarded, according to Dr. Williams, as an unfavourable sign ; but the author has not been impressed with this circumstance. It has been a common belief amongst medical men that the *genital function* is more excited during phthisis. M. Louis, however, on every occasion in which he made the inquiry of males, found that their amative propensities had failed in proportion to the loss of strength, the general indisposition, and the other symptoms—very much in the same manner as in persons affected with any other chronic malady, and enfeebled to a like degree. The great majority replied to his question, whether their sexual feelings had become more strongly developed than in health, in such a manner as to show, that they regarded the inquiry as not a little absurd. He does not deny, however, that where the tuberculosis has made but little progress, and but slight diminution of strength has taken place, although sufficient to prevent the patient from pursuing his ordinary avocations, some of them may experience stronger sexual inclinations than in health; but this might be explained as an effect of idleness, which—he properly remarks—is the most favourable condition for the play of the imagination on such matters.

Pulmonary consumption is essentially a chronic disease. Its mean duration, according to the observation of pathologists is, in hospital practice, twenty-three months. This includes the extreme cases; but more than one-half of 314 recorded cases terminated in nine months, and the greater proportion of these between the fourth and ninth months. By excluding the cases, that ended within four months—which amounted to 24—as well as those that exceeded four years—amounting to 19—the average duration of the remaining cases is eighteen months. It is manifest, however, that various circumstances must modify the duration of the disease. Amidst the comforts and advantages of private life, we should expect it to be more protracted: and much must depend upon age, sex, constitution, &c., as well as on climate, season, and other influences.

According to Dr. P. Hennis Green, the main character which distinguishes the phthisis of children from that of adults is, that in the former the tubercular deposit occupies a much larger surface of the lung, is more rapidly secreted, and is complicated with tuberculosis of other organs more frequently than in the latter. Hence children sink under the affection earlier than adults, and the disease, from the diffusion of the tuberculous matter, is diagnosticated with greater difficulty.

Causes.—These may be divided into the *extrinsic* and the *intrinsic*.

a. *Extrinsic causes.* 1. *Climate.*—Pulmonary consumption has been seen in all or almost all climates, but by no means in an equal degree of frequency; yet our information as to the precise *modus agendi* of climate in causing phthisis is sufficiently imprecise. It is much less common in Russia than in this country, and this is attempted to be explained by Sir Geo. Lefevre, by the fact, that the Russians protect themselves much more against the cold in their houses, and when in the open air; but it remains to be seen, whether this explana-

tion be applicable to the natives of hyperborean regions in general, who are less capable of protecting themselves than the Russians. A cold, damp, and variable climate—like that of Great Britain—is conceived not only to give the predisposition, but to become an exciting cause of the disease; yet it prevails to a like extent in many of the more dry, less cold, but scarcely less variable situations of southern France and Italy; and it is fearfully rife in many parts of the torrid zone, where none of these conditions of climate exist. As a general rule, it would seem, that the deaths diminish in a direct ratio with the mildness of the climate; but great heat appears also to have a powerful effect in predisposing to tuberculous disease. The table—cited in an early part of this article from Dr. Emerson—of the average mortality of phthisis in the four largest cities of the Union—is signally elucidative of the difficulties that environ us, in accounting for either the general, or particular, mortality of any place as compared with that of others.

Within the limits of the United States, the range of the thermometer is considerable—much more so than in Great Britain. This applies even to St. Augustine, Pensacola, Enterprise, St. Mary's, and other places in Florida and Georgia, which have been regarded as eminently favourable winter-retreats for the phthisical valetudinarian. The medium heat is, however, higher in those southern situations; and this, along with other atmospheric advantages, may, in part, counterbalance the evil. Yet, although the climate of the United States is proverbially one of great vicissitudes, the number of deaths by consumption is probably not as great as in England, or in many of the situations of southern France and Italy, which have been selected as winter-retreats for the consumptive. A respectable physician of the navy, Dr. Hulse, has asserted, that he has never known, or heard of, a case of consumption that originated in Pensacola. The West Indies, and Peru, would seem to be unusually exempt from phthisis, as a disease of the inhabitants; but the mortality from it among the British troops and others stationed in the West Indies, is by no means small; and hence it has not been regarded by some as a favourable residence for the phthisical of other countries. It would appear, indeed, from the statistical report on the sickness, mortality, and invaliding among the British troops in the West Indies, by Major Tulloch, that in Jamaica, with a high temperature, consumption is as frequent among the British troops as in Britain. The results, too, obtained statistically in the West Indies, by no means favour an opinion, hereafter referred to, that there is an antagonism between diseases, which are the product of marshy emanations and phthisis. They prevail together, without seeming to exert any influence upon each other. M. Rufz states, that in Martinique, where he practised for some years, this disease is the most frequent of all chronic maladies; and he adds, that of the various races inhabiting the Antilles, Europeans and Africans are less subject to it than Creoles; and among the Creoles, the white and mulatto more so than the negro. He farther affirms, that the influence of the climate of the Antilles on patients going from Europe, in a state of declared phthisis, is not deducible from his own

experience, but that, on the other hand, the removal of phthisical patients from these islands to Europe is extremely pernicious.

One interesting fact, by the way, has been established by recent statistical observations — that consumption is much less frequent amongst sailors than amongst soldiers. The benefits of a sea voyage to the phthisical valetudinarian have been long known, and there can be no doubt, that in those who are predisposed to pulmonary disease, the revulsion thereby effected in the system may prove most salutary. According to the statistical reports laid before the House of Commons, it appears, that in the West Indies and North America, the mortality from consumption in the navy was at the rate of 1·9 per 1000, whilst amongst the soldiers in the same region, the returns were as follows. In the Windward and Leeward command, 12 per 1000 were attacked annually with consumption; in Barbadoes 15·8 per 1000 die of it; in Jamaica 7·5 per 1000; and in the more northern portions of the same command, the deaths from diseases of the lungs among the troops were, in Nova Scotia and New Brunswick, 7·1 per 1000, and in Canada 6·7 per 1000. In Bermuda, there were attacked annually with consumption, 8·8 per 1000.

When a tuberculous individual passes from a warm and dry country, to one that is cold and damp, the tubercles undergo development. It was observed, that the French regiments suffered more from phthisis in Holland, than in Spain and Italy; and it would appear, that almost all the animals, which are brought from the torrid regions to our menageries, die of tuberculosis of the lungs.

2. *Season.*—In the temperate regions of the globe, winter and spring appear to be most favourable to the development of phthisis, because, in those seasons, there is the greatest union of cold and moisture. The remark has been made, that near the sea there are but few consumptive cases; but this must depend greatly upon the exposure. If, for example, as on the seaboard of the United States, the place be exposed to the constant northeast storms and winds from the ocean, that prevail during the winter, the effect cannot fail to be seen on the tuberculous. Where tubercles already exist, a warm, dry air will have the same influence in favouring their development as the heat of the torrid regions of the globe; and the absence of solar light has been thought to produce the same effects as humidity. It is well known, that privation of light occasions, or favours, imperfect development of the frame, and hence any situation, from which light is excluded, may lay the foundation for tuberculosis, which must be regarded as a disease dependent upon defective and vitiated action of the tissues in which the tubercles are formed; and this, we shall see, is dependent, again, upon an unhealthy condition of the system, which favours their deposition.

According to the annual report of the interments in the city and county of New York, for the year 1839, the number of deaths in the different months from consumption was as follows: September, 134; April, 126; March, 125; December, 124; August, 118; February, 114; January, 101; October, 100; May and November, each 99;

June, 88; July, 87;—total, 1315. So far as this table goes, no satisfactory inferences can be deduced as to the effect of season.

3. *Atmospheric vitiation.*—Atmospheric impurity has, unquestionably, much to do with the causation of tuberculosis; accordingly, it is found that they who live in restricted habitations, where ventilation is imperfect, and especially where numbers are crowded together in a small space, suffer much from tubercular disease. All living bodies, when crowded together, deteriorate the air so much as to render it unfit for the maintenance of the healthy function. If animals be kept crowded in ill-ventilated and badly lighted apartments, they speedily sicken. The horse is attacked with glanders; fowls with pep; and sheep with a disease peculiar to them, if they be too closely folded.

It would appear, that the young, especially of the animal creation, and particularly of the human species, require the respiration of pure air, otherwise they perish. The experiments of Jenner and Baron, have shown, that if young animals be deprived of their open range, and especially if the character of their nourishment be modified, a foundation is laid for disorganization and death. A family of young rabbits was placed in a confined situation, and fed with coarse green food—such as cabbage and grass. They were perfectly healthy when put up. In about a month, one of them died: the primary step of disorganization was evinced by a number of transparent vesicles, studded over the external surface of the liver. In another, which died nine days after, the disease had advanced to the formation of tubercles in the liver. The liver of a third, which died four days later, had nearly lost its true structure, so universally was it pervaded by tubercles. Two days subsequently, a fourth died; a considerable number of hydatids was attached to the lower surface of the liver. At this time, three young rabbits were removed from the place, where their companions had died, to another situation, dry and clean, and to their proper and accustomed food. The lives of these three were obviously saved by the change. Similar results were obtained from experiments of the same nature performed on other animals. It can hence be understood, that where an individual has tubercles already present in the lungs, confinement to a chamber, with a regulated temperature during the winter season, may be obnoxious to weighty objections, owing to the greater or less degree of vitiation of the air of the apartment; and, accordingly,—as will be shown hereafter,—it has been recommended to send the consumptive invalid abroad, in the winter season, when the air is dry, although it may be cold, rather than to adopt this questionable procedure. It can be further understood, that such occupations as those of the needle-pointer, dry grinder, stone-mason, miner, collier, feather-dresser, cotton-manufacturer, &c., may act, at least, as exciting agencies, and probably lay the foundation for phthisis; for, although it has been questioned, whether the consolidation of the lung, which is found in such cases, be really tuberculous, the difference, as remarked by Dr. C. J. B. Williams, is so slight, that they can scarcely be separated. Moreover, the special consolidation and phthisis are often coexistent. Dr. Favell exhibited

before the Sheffield Medical Society, on October 19, 1843, a portion of the superior lobe of the left lung of a razor-grinder, who had died from pneumonia of the right. The portion shown had the consistence of india-rubber, with numerous small, dark-coloured bodies like granulations;—also, a portion of lung from the body of a table-knife grinder, which was exceedingly dark-coloured and dense, and had lost the usual structural appearance of pulmonary tissue;—and portions of the lungs of a pen-blade grinder, the external surface of which was thickly studded with small black spots, about the size of currants. Similar bodies were discovered in the internal structure of the lungs, and here and there they had aggregated so as to form large masses, which were very dense. The branches of vessels, arteries, veins, and bronchia, were considerably dilated, and the lining membrane of the latter was much injected. There was slight emphysema at the edges of the lungs, and at the posterior surface of the inferior lobe. The bronchial glands were enlarged, and of a black colour; and several of them contained calcareous matter. Dr. Favel also exhibited to the Society a drawing of the section of the lung of a fork-grinder, in which a hardened mass, about the size of a pigeon's egg, on being laid open, presented the appearance of the lung in pulmonary apoplexy.

Dr. G. Calvert Howard, of Sheffield, England, has stated, that the influence of gritty and metallic particles on the respiratory organs is rather to induce two important structural changes—an enlargement of the bronchial tubes, and an expansion of the pulmonary tissue. He objects, however, to the term *grinders' asthma*, by which the pulmonary affection of the Sheffield workmen is designated, because "in an immense number of cases which came under observation, we do not perceive the phenomena of asthma, but of tuberculous phthisis." The structural changes referred to by Dr. Holland are not invariable effects, but they are produced in an immense number of instances. Dr. Alison affirms, that there is hardly an instance of a mason, regularly employed in hewing stones, in Edinburgh, who lives free from phthisical symptoms to the age of fifty. Under such circumstances, extraneous particles have often been found in the indurated lung. Dr. John Home has given the case of a stone mason, who died of phthisis, and in the centre of many of the tubercles was found an earthy nucleus, which turned out to be of precisely the same character as the stone of the Craigleith quarry, where he had been working. In workers in coal mines, the texture of the lungs has been completely blackened by coal dust, so as to constitute *anthracosis*. In the case of the steel-workers at Sheffield, we are told by Mr. Knight, that the fork-grinders, who grind dry, so that the particles are readily received into the air, do not reach the age of thirty-two; whilst the knife-grinders, who work on wet stones, generally live to forty or fifty. The statistical evidence, afforded by Dr. Holland in regard to the fatal influence of fork-grinding, is truly appalling. The following table, being a comparison of deaths at particular ages, in 1000 deaths of persons above twenty years of age, in England and Wales, in Sheffield generally, and of the fork-grinders particularly, is given by him.

Ages.	England and Wales.	Sheffield.	Fork-grinders.
20 to 30.	160	184	475
30 to 39.	136	164	410
40 to 49.	126	158	115
50 to 59.	127	155	0
20 to 60.	549	661	1000

From this table, then, it appears that the whole 1000 of the fork-grinders die before the age of 50.

From elaborate investigations in regard to the influence of employment on the production of phthisis, Dr. Guy infers, that the ratio of cases of pulmonary diseases is highest, both in the male and female sex, amongst those following in-door employments; and in the case of men it varies inversely with the amount of exertion; being highest where there is least exertion. Neither a constrained posture, nor exposure to a high temperature, nor a moist atmosphere, appears to have any marked influence in inducing consumption.

The results of the inquiries of different observers, as to the influence of trades and professions on the production of phthisis, have not been very accordant; and the difference has arisen partly, perhaps, from the circumstance of exposure to vicissitudes, to imperfect light and ventilation, and insufficient nutriment not having been always taken into sufficient consideration. For example, in Berri, France, there is a village, in which almost all the inhabitants follow but one profession —that of makers of gun-flints, whence they have been called *Caillouteux*. Almost all these persons, according to M. Benoîston de Chateauneuf, die of phthisis, or at least few pass the age of 40 without affording evidences of tuberculosis. This has been attributed to particles of siliceous dust in the air passing into the lungs; but M. Andral, who visited the place, affirms that the dust of the flints can never reach the mouth, and cannot, therefore, be respired. He attributes the phthisis to the workmen being compelled to have their feet in constant contact with very cold stones. It has been presumed, that the inhalation of the fine particles, in the occupations above mentioned, can only act as an exciting cause, by developing predispositions that may have previously existed: it is certain, however, that the mortality from phthisis, in some of those employments, is much greater than in others in which the collateral circumstances would appear to be quite as unfavourable to the general health. Dr. Guy found the ratio of pulmonary phthisis to all other diseases to be highest amongst men exposed to the inhalation of dust. This much, perhaps, may be determined. M. Louis, however, was of opinion that, with the materials within his reach when he issued the second edition of his Researches on Phthisis, the problem of the influence of professions and trades on the development of phthisis was unsusceptible of solution.

4. *Faulty alimentation* is doubtless, also, one of the important extrinsic causes of phthisis, and of the tuberculous condition. Exclusive vegetable diet, or a defective supply of animal food, has been re-

garded specially obnoxious; but much depends upon habit. If a person have been accustomed to a mixed diet of animal and vegetable food, and be subsequently restricted to either one or the other, his nutrition is apt to become impaired, and cachexia to be induced; but habitual diet has probably not much influence; and, that a free allowance of animal food does not alone prevent phthisis, is shown by the circumstance, that in England, where the diet is perhaps more largely animal than in other countries of Europe, phthisis is probably more frequent. It would not seem, however, that intemperance developes tubercles. Of 35 persons dying of various diseases, all of whom were decidedly intemperate, and most of them grossly so,—in 26, according to Dr. J. B. S. Jackson, of Boston, no tubercles were found; in five there were tubercles in the lungs; in one in the bronchial glands; and only two died of phthisis. In several of the most striking cases, the organs were as free from tubercular disease as those of a new-born infant. These results have led Dr. Jackson to suggest, whether intemperance may not have some effect as a prophylactic. "The remedy," he adds, "to be sure, would be worse than the disease; but has it any such effect?" The author's experience would certainly lead him to similar conclusions. Dr. Guy, however, found the ratio of pulmonary phthisis to all other diseases high amongst the intemperate.

5. *Influence of articles of dress.*—Where a female is predisposed to phthisis, irregularities of exposure of the body generally, but especially of parts that are habitually covered, to cold and moisture, may act as exciting causes. It has been generally, too, believed, that tight corsets may prove injurious, by preventing the due expansion of the chest, and in this manner favour the disease. When worn at an early age, and before the chest has undergone its full development, they may prevent this, and thus act injuriously. Yet it has been affirmed, on the high authority of M. Louis, that "the alleged influence of clothing, and especially of corsets, on phthisis, is perhaps nothing more than matter of assertion wholly unsupported by proof."

b. *Intrinsic causes.* 1. *Constitution.*—It has been presumed, that the formation of tubercles in the lungs, as elsewhere, originates in a *Tuberculous constitution or diathesis, Phthisiosis;*—and in *Tuberculous cachexia, Tuberculosis, Morbus tuberculosus, Dyscrasia tuberculosa;* Fr. *Cachexie* ou *Dyscrasie tuberculeuse;* Ger. *Tuberkelkrankheit, Knotensucht.* The characteristics of this tuberculous constitution are chiefly those of the strumous or scrofulous;—fair skin, light hair, blue eyes, and thick upper lip. Along with these signs, there are often, also, long neck, narrow chest and projecting shoulders. So far, however, as the observation of the author goes, the large mass of the phthisical do not present these characters. In the published experience of one observer, Dr. Morton, of Philadelphia, almost two-thirds of the consumptive patients, who have fallen under his notice, have had dark hair, dark or sallow complexions, and dark eyes; and such has been the result of the author's observation. In the negro, both the scrofulous and the tuberculous constitution are often met with, and some of the most decided, and most rapid, cases of phthisis occur in them. In the United States, scrofula—at least in the ordinary glandular form

—cannot be considered as by any means common among the white inhabitants,—that is, if Great Britain be taken as the standard of comparison; but it is one of the diseases to which the black population are especially subject.

The tuberculous and the scrofulous constitution appear to be distinct, although congenerous;—an individual may have tubercles existing to a considerable extent in the lungs and other organs, without the usual indications of scrofula in the lymphatic glands or ganglions; and on the other hand, disease may be prominently developed in the latter, without any evidence of the presence of tubercles in any of the internal organs. Of *seventeen cases*, according to Mr. Philips, of scrophulosis, where life had been destroyed by the exhaustion consequent upon profuse discharges from ulcerated surfaces and scrofulous caries, only *one* presented considerable tubercular deposition in the lungs, and only *nine* any traces of it. Of *eighty-six* cases of tubercular phthisis, only *one* exhibited any cicatrix or other evidence in the neck, the axilla or the groin, of having suffered from disease of the lymphatic ganglia of those regions. Of *three hundred and fifty-eight* cases of tuberculosis of the lung, that fell under the care of M. Louis, *thirty* were found to present more or less traces of the deposition of similar matter in the lymphatic ganglia. MM. Rilliet and Barthez, however, consider scrophulosis and tuberculosis to be identical, and that the former term should be banished from medical terminology; and many others accord with them. (See Scrofulous Cachexia.)

Narrowness of the chest has been generally considered to afford a predisposition; but, according to M. Woillez, such is not the case, unless it is coupled with an incomplete development of the transverse diameter; and therefore, it is incorrect to say, that subjects of small thoracic capacity are more liable than others to pulmonary tubercles.

According to some pathologists, a tuberculous constitution—natural or acquired—must always be present before any exciting cause can induce phthisis; according to others, the disease is a chronic inflammation of the pulmonary tissue, and may be developed in the absence of any such constitution. The former of these opinions appears to be most in accordance with observation and reflection.

2. *Age.*—It was at one time believed, that tubercles in the lungs and elsewhere prevail only in the adult age, and chiefly between 18 and 35; but it is now sufficiently established, that they may occur at all ages, and even in the fœtus in utero, although this is rare, inasmuch as M. Guyot, according to M. Papavoine, did not observe them in a single one of 400 bodies of newborn children examined by him. It would seem, however, from recent researches, that the greatest number of tuberculous cases occurs at an early age. M. Papavoine has, indeed, shown that in three-fifths of the children of the common people who die, tubercles are found; whilst, according to M. Louis, the proportion of tuberculous adults who die in the hospitals was only two-fifths of the whole. Comparing the different periods of infancy with each other, M. Papavoine has shown, that tubercles are less common from birth to three years of age; that they augment in frequency from four to seven; and that at the period of puberty their frequency is nearly the same as

between three and four years of age; and somewhat similar results have been obtained by MM. Rilliet and Barthez. It would appear, indeed, from a table drawn up by M. Papavoine, and cited in the admirable work of M. Louis, that from the fourth to the thirteenth year the number of children affected with tubercles was invariably greater than that of those free from them; and that the frequency of tubercles was more especially great between the ages of four and seven. From observations made in this country, as well as in Europe, it would seem, that the greatest number of deaths from pulmonary consumption occurs between the ages of 20 and 30; the next in proportion between 30 and 40; the next between 40 and 50; the succeeding grade of mortality is sometimes placed between 15 and 20; at others between 50 and 60, or even above 60. This remarkable agreement of observers in different parts of the globe warrants the deduction, that after the fifteenth year, fully one-half of the deaths from phthisis occur between the twentieth and fortieth years of age; and that the mortality from the disease is about its maximum at 30, and from that time gradually diminishes. M. Andral thinks, from his researches, that males, after puberty, are particularly liable to tubercles between the ages of 21 and 28, whilst females seem to be more exposed to them before 20; and M. Lombard is of opinion, that after the age of puberty females are most liable to tubercles between 18 and 20 years of age; and males between 20 and 25. From the New York report of interments for the year 1839, it appears, that, of 1315 registered cases of consumption, 31 occurred under the age of one year; 39 between 1 and 2 years; 58 between 2 and 5; 44 between 5 and 10; 67 between 10 and 20; 335 between 20 and 30; 318 between 30 and 40; 197 between 40 and 50; 127 between 50 and 60; 68 between 60 and 70; 25 between 70 and 80; and 6 between 80 and 90. The report of the Board of Health of Philadelphia, for the same year, gives 708 deaths from pulmonary consumption; of which 24 occurred under one year; 15 from 1 to 2; 29 from 2 to 5; 13 from 5 to 10; 5 from 10 to 15; 36 from 15 to 20; 206 from 20 to 30; 164 from 30 to 40; 102 from 40 to 50; 55 from 50 to 60; 38 from 60 to 70; 17 from 70 to 80; 3 from 80 to 90; and 1 from 90 to 100.

3. *Sex.*—The influence of sex is not settled. The common opinion is, that females are more subject to phthisis, and such is the view of some excellent authorities; and from the researches of MM. Papavoine and Rilliet and Barthez, it would seem, that in Paris at least, the greater liability on the part of the female exists at all ages. Of 9549 recorded cases of phthisis, according to M. Lombard, 5589 occurred in females, and 3960 in males. In Paris, according to a report of the *Conseil de Salubrité* and Chabrol's *Statistique de la Ville de Paris*, the proportion of phthisical males to phthisical females was as 10 to 13·8. In certain other cities, however, of this country and Europe, the ratio was 10 males to from 8·7 to 8·9 females. At the adult age, when consumption chiefly prevails, the numbers of men and women living are nearly equal; yet in 1839, in England and Wales, 31,453 females, and 28,106 males died of this disease. The annual rate of mortality

by it was—*males*, ·003722; *females*, ·004015: in 1838, it was—*males*, ·003873; *females*, ·004077. In New York, during the year 1839, the number of males was 704, and of females 611; or in the proportion of 10 males to 8·7 females nearly. In Philadelphia, on the other hand, during the same year, the number of deaths from phthisis was—of males 335, and of females 373,—or in the proportion of 10 males to about 11 females.

4. *Hereditary conformation.*—This is perhaps one of the most important of the causes of tuberculosis, and especially of tubercular phthisis. A patient, affected with tuberculous cachexia, entails on his offspring, not tubercles, but a predisposition to them, which may be warded off, by avoiding the exciting causes, but may be developed by causes, which would be entirely inoperative in one not so predisposed. It is important, therefore, in the history of any case, to discover, whether the parents or any member of the family have died of the same disease. It would not appear to be tuberculous cachexia alone in the parent which lays the foundation for this fatal malady in the offspring. There are several diseases, which have been supposed to produce the result, and the most frequent and important of these are disordered states of the digestive organs and their consequences;—indeed, any state of deteriorated health in the parent from any cause may give rise to this cachexia in the progeny; but although the hereditary character of phthisis is generally admitted, one eminent observer, M. Louis, affirms, that he has observed nothing decisive in favour of it.

5. *Inflammation of the respiratory organs, and other diseases.*—Mention has already been made of the supposed inflammatory origin of tubercles; and those remarks may be transferred to pulmonary consumption. The opinion of M. Broussais, that "the term phthisis pulmonalis, as it expresses only the disorganization, which is the product of inflammation of the pulmonary parenchyma, ought not to be applied to this phlegmasia," and that "it would be better to call it *chronic pneumonia*, thus specifying the tissue of the organ in which the disease commenced," expired almost with its promulgator; yet, there are still many, who consider that irritation or hyperæmia is, in most cases, connected with tubercular formation and development. It is questionable, however, whether any greater irritation or hyperæmia exist in such cases, than in any other case of heterologous secretion.

It seems clear, that in order for inflammation of the air-passages to be followed by the production of pulmonary tubercles, there must be a predisposition; and, if this be admitted, it can be readily conceived, that in one individual, very slight bronchitis may be sufficient to produce tubercles, whilst others may not become phthisical from the most severe and long-continued catarrh. At the same time, we can understand, that inflammatory affections of the air-passages may, by persistence, induce the tuberculous constitution or cachexy, and, in this way, be not only the predisponent, but exciting, cause of phthisis. It is certainly, however, uncommon to see the symptoms of phthisis follow immediately the termination of inflammation of the respiratory organs;

and where this occurs, the production of tubercles ought not, as M. Louis has urged, and M. Grisolle accords with him, to be referred to such inflammation, seeing that other affections, into which inflammation does not enter, present the same circumstance, and in very nearly the same proportion. M. Grisolle found, that phthisis did not immediately follow pneumonia, except in very rare cases,—less than one-thirtieth of the whole number; and of 80 patients who were enabled to give M. Louis an account of the diseases they had suffered under prior to the outbreak of phthisis, 23 only were very subject to attacks of pulmonary catarrh, whilst 52, or about two-thirds of the whole number, were rarely so affected. It would seem, too, that the non-dependence of tubercles on pneumonia and bronchitis is not confined to temperate climates, but that it exists also in hot countries, or at least in some of them. Of 1954 patients treated by Dr. Rufz, between the years 1836 and 1839, at St. Pierre in Martinique, 3 only were affected with pneumonia, and not a greater number with bronchitis; whereas 123 laboured under phthisis.

Some light is thrown on the subject by recent researches of M. Andral into the condition of the blood in various diseases. He found, when tubercles were under the form of hard masses, without any sign of inflammation around them, the blood constantly exhibited, on analysis, its normal quantity of fibrin; but in proportion as they experienced softening, a process of elimination, similar in its character to the inflammatory process, was established around them; the blood became charged with a larger and larger quantity of fibrin; so that, he properly infers, the formation, in excess, of this principle is not dependent upon the development of the accidental product, but rather on the inflammation, which becomes associated with it at a certain period of its existence:—an additional fact—he adds—to many others, that the process which creates different accidental products is not of the same nature as that which constitutes inflammation. In all the cases of incipient tuberculosis the individual was, to a certain degree, anæmic, or the blood possessed a modification of composition like that which belongs to feeble constitutions, or those in which, owing to some cause, the vital forces have lost their energy. The quantity of globules was diminished. In proportion, too, as the tubercles progressed, the diminution of the globules became greater and greater; and when the lungs were filled with caverns, it attained its minimum: yet this diminution was never as great as in chlorosis. M. Andral has only seen a single case in which the proportion of globules was below 80 in 1000. In every other case it oscillated between 80 and 100. "Is it not singular to see," he adds, "without any other appreciable alteration of the lung or of any other solid, the globules spontaneously descend in chlorosis to below 30; whilst their minimum remains at 72 in a disease, in which it might seem that the state of the lung could scarcely permit blood to be formed. And yet, not only the globules do not diminish as much as might be supposed; but when the lung is already in a great measure destroyed, the fibrin augments in quantity, and the temperature of the body may be elevated as in typhoid fever or acute pneumo-

nia. I have seen it rise as high as 39° and 40° (cent.) in the hectic fever, which commonly attends the last stage of phthisis."

Of thirty phthisical cases, whose blood was examined by M. Andral, he heard in one only a *bruit de souffle* in the carotid arteries. This was in the case of an individual whose blood contained only 72 parts in the 1000 of globules.

It would appear from all the recent histological investigations, that the blood of scrofulous and tuberculous individuals is not deficient in the fibrinous element; but that it is not duly elaborated; and hence the nutritive processes are imperfectly executed, and cacoplastic or aplastic products are deposited instead of the healthy elements,—the semitransparent, miliary, gray and tough yellow forms of tubercle exhibiting traces of organization in the form of cells and fibres, but never undergoing farther organization, and therefore cacoplastic; whilst the opaque crude or yellow tubercle exhibits no evidence of structure, or is wholly aplastic. This deterioration of the blood and nutritive actions is important to be borne in mind in the treatment of scrophulosis and tuberculosis.

Dr. Stokes separates phthisis into two classes—the *constitutional* and the *accidental*. In the first, tubercle supervenes either with or without precursory irritation, in persons strongly predisposed to it by hereditary disposition, or original conformation. In these, the disease is generally rapid, invades both lungs, and is complicated with lesions elsewhere. The disease is constitutional, and the affection of the lung, although the first perceived, seems only a link in the chain of morbid actions. In the second, the disease is met with in persons, not—he considers—of the strumous diathesis, and who have no hereditary predisposition to tubercle. In this case, it results from a distinct local pulmonary irritation, advances slowly, and the digestive and other systems show a great immunity from disease. In the accidental phthisis, the lesser tendency to abdominal and other complication allows time for the vital powers to act; whilst, in the constitutional variety, tubercle is commonly deposited throughout the body, and the patient dies rapidly in consequence of the extent of the disease.

Amongst the predisposing causes of tubercular phthisis have been reckoned syphilis, scurvy, rickets, &c., and hence the various epithets, *syphilitic*, *scorbutic*, &c. applied to it by some writers. It is questionable, however, whether these affections predispose to the disease in any other manner than by modifying the nutrition of the frame, and evidence is wanting to show, that they can have any agency in the causation of phthisis, unless the tubercular diathesis is present. In many cases, there is unquestionably mere correlation of existence.

Lastly, in regard to the causation of phthisis, a brief allusion is necessary to the notion, that it is capable of being communicated from one person to another. The author has had no adequate evidence, that it can be extended in this manner; yet, singular instances of the kind have been related by different writers, and if they prove nothing more, they exhibit strange coincidences. In Italy, the contagious nature of phthisis appears to be admitted by almost all. When an individual dies at Naples of the disease, in

a private house, not only are his effects, and the furniture which he has used, destroyed, but the walls are scraped and whitewashed, and the ceilings, floors, and partitions removed. Similar views appear to be entertained at Rome, where phthisis is even more frequent than at Naples. Where such a sentiment prevails so extensively amongst the profession, it would appear arrogant to presume, that observation has been altogether erroneous, or to assert, with a recent writer—Dr. Chapman—that "there is now no respectable professional authority" in favour of contagion. Certain it is, that the cases are rare, in this country, in which the communication of the disease from one person to another by contagion could even be suspected. It can be understood, however, that if a person be constantly breathing the generally deteriorated atmosphere of the rooms, which the consumptive occupy, by sleeping perhaps in the same bed, the health may ultimately suffer, tuberculous cachexy be induced, and ultimately confirmed phthisis.

Pathological Characters.—The anatomical characters of pulmonary tubercle have been so fully described in an early part of this section, that it is but necessary to refer to it. But, along with the morbid appearances presented in the lungs themselves, by those who have died of phthisis, there are others frequently met with in other parts of the body, which require mention. In the larynx and trachea, ulcerations, of different dimensions, frequently exist, with more or less redness of the mucous membrane. At times—as in a case recently under the author's care—the vocal cords are entirely destroyed, as well as the superior ligaments of the larynx. Ulcerations of the epiglottis are by no means uncommon, even when none exist in the larynx and trachea. They are generally on its laryngeal surface. From the statistical information contained in the last edition of the work of M. Louis on Phthisis, (Paris, 1843,) it appears that in 190 cases, there were ulcerations in the trachea, in 76 cases; in 193 cases, ulcerations of the larynx in 63; in 134 cases, ulcerations of the epiglottis in 35; and in 49 cases, ulcerations of the bronchia in 22; these lesions were found much more frequently in males than in females:—why, it is impossible to say.

Adhesions between the lungs and the pleura are almost always observed to a greater or less extent. In one hundred and twelve subjects M. Louis found but one whose lungs were perfectly free in every point of their surface. Where the adhesions are old, the bond of union is firm, and not readily lacerable; but where the inflammation has occurred a short time prior to dissolution, the false membrane may be soft, readily torn, and present the characters described under Pleurisy.

Phthisis has been ranked as one of the causes of aneurism of the heart, but it is not common to find any increase in the size of that organ. Atrophy of the heart is, indeed, more frequently met with than hypertrophy. The author has, in one or two instances, observed fibrinous concretions in the heart, dependent upon the difficult transmission of blood through the lungs, the presence of which was suspected, by auscultation, during life.

The spleen was found—in 90 observed cases—augmented in size, 16 times; diminished, 15 times; healthy, 59 times. Often, tubercles have been observed in it, especially in children.

In four-fifths of those who die of phthisis, the digestive organs, according to M. Louis, are found to exhibit more or less evidence of disease. Tubercles, in every degree of development, may be met with in nearly the whole extent of the small intestine below the duodenum; but they are more numerous near the cæcum than elsewhere. Ulcerations of the small intestine are still more common, and they, also, are more numerous, and more extensive and deep, the nearer we approach the cæcum. In 95 cases, tubercles were met with 36 times; ulcerations, 78 times. After the cicatrization of these ulcers, it has occasionally happened, that narrowness of the bowel has been induced, which has eventuated in death. In some cases, the intestine has been found perforated. The same morbid appearances are met with in the large intestine. The opinion has long been entertained, that fistula in ano is, in some measure, connected with the tuberculous cachexy or diathesis. The notion is, however, discarded by excellent observers, as by MM. Louis and Andral; the latter of whom ascertained its existence only once in 800 tuberculous subjects; nor has the author had any reason to believe in the connexion. Doctor Morton states, that he has met with four cases, in three of which fistula supervened so directly on the pulmonary symptoms, and so kept pace with them, that he "could scarcely consider its presence as an accidental coincidence."

The different lesions of the alimentary tube may occur simultaneously with those of the lung; but more commonly, the symptoms of intestinal inflammation and ulceration take place after the pulmonary mischief has made considerable progress.

The mesenteric glands, according to M. Louis, were found tuberculous 23 times, in 102 observed cases, and the glands most affected were those nearest the cæcum. The coexistence of tuberculosis of the lung and mesenteric glands is more frequent, however, in the child than in the adult. The cervical glands were found tubercular, and increased in size 8 times in 80 cases. The bronchial glands—as before remarked—may also be the seat of tubercles: under such circumstances, they are, usually, of greater size, and of a gray or blackish colour. The peritoneum, in many cases, is found to be affected with tubercular inflammation; or gray semitransparent granulations are met with in the membrane, or in layers of false membrane on its surface, both of which have been considered to be confined to phthisis; but the author has met with one case, in which the lungs were very slightly affected, although tubercles were numerous under the peritoneum. The most common morbid appearance, presented by the liver in phthisis, is the fatty transformation. In 120 cases, it was observed 40 times. The liver, in this condition, is pale, almost always of a light brownish-yellow colour, and spotted with red externally and internally. Its volume is nearly always augmented, and, at times, to double its usual dimensions. The increase is almost always at the expense of the right lobe. The liver has been observed to overlap a large portion of the anterior surface of the stomach, to occupy the epigastrium, extend the breadth of two or three fingers below the false ribs, and reach the iliac crest and the spleen, which is occasionally

covered. Its consistence is usually, in these cases, greatly diminished; and, in very advanced cases, the scalpel and the hands are greased, as by ordinary fatty substances.

The fatty transformation of the liver is almost confined to phthisis pulmonalis. Of 120 cases, observed by M. Louis, 40 were cases of phthisis. The change is much more common in the female than in the male; as, of the 49 cases above mentioned, ten only occurred in the latter. Tubercles and hydatid cysts have likewise been found in the livers of the phthisical. Generally, in those who are affected with the fatty transformation, the bile in the gall-bladder has a blackish colour and pitchy consistence, intermediate between that of a solid and a liquid body. In one case, tubercles were observed in the parietes of the gall-bladder, and in the biliary ducts. Very rarely, too a small quantity of tuberculous matter, unsoftened, has been met with in the suprarenal capsules, and likewise in the kidneys.

Of 40 subjects, in whom the genital organs were examined, 3 exhibited tuberculous matter in the prostate; and it was found, at the same time, in the vesiculæ seminales and the vasa deferentia. In the female, tuberculous matter has, at times, been seen in the substance of the uterus, and in the ovaries.

Lastly. The arachnoid coat of the brain is often partially thickened, presenting more or less numerous granulations in its upper portion, especially near the falx. In three-fourths of the cases observed by M. Louis, the tissue, uniting the arachnoid to the pia mater, was infiltrated, and the ventricles distended by an appreciable quantity of serum. Hydatids and tubercles are, likewise, found in the encephalon,—rarely in the adult, but more frequently in the child.

Treatment.—Although cases of confirmed phthisis may be regarded as almost universally beyond the resources of art, much may be done in the way of palliation; and it is important to bear in mind, that solitary and circumscribed excavations have unquestionably cicatrized, or ceased to exert any influence. The chief indications, in the treatment of tuberculosis, are, 1, to diminish any local irritations, or hyperæmiæ that accompany and develope, if they do not lead to, the formation of tubercles; 2, to correct the condition of the system of nutrition, that constitutes the tuberculous cachexy; 3, to promote the removal of tubercles already deposited; and, lastly, to treat troublesome symptoms and accidental complications. Bearing these indications in mind in the subsequent remarks, the treatment may, for convenience, be divided into the *hygienic* and the *therapeutical*.

a. *Hygienic treatment.*—It has been stated, that the tuberculous constitution is often communicated by the parent to the progeny. In the way of hygiène, it is, therefore, important, that precautions should be taken by parents themselves, and every step be avoided, that can deteriorate their own general health. If more consideration were bestowed on matrimonial alliances, and a more healthy and natural mode of living were adopted, by persons in that station of life, which gives them the power of regulating their mode of living according to their own choice, the predisposition which is so often entailed upon their offspring might be checked, and even extinguished in their family, in the course

of a few generations. "The children of dyspeptic persons," observes Sir James Clark, "generally become the subjects of dyspepsia in a greater degree, and at an earlier period than their parents; and if they marry into families of a delicate constitution, their offspring become highly tuberculous, and die of phthisis in early youth and even in childhood." These remarks are unquestionably just; but how impossible is it to regulate the feelings of individuals, so that any prudential restraints shall be regarded! Every practitioner who has been consulted respecting the propriety of marriage, where one or both of the parties have laboured under a disease, or a predisposition unquestionably hereditary in its nature, and who has given advice befitting the occasion, must, at times, have had the mortification to find his advice wholly disregarded, and that he has, at the same time, for ever lost the good opinion of both parties. On the part of the mother, care is, doubtless, demanded, for the plenary health of the offspring, during the period of gestation. But the prevention of hereditary transmission regards rather the condition of both parents at the time of a fecundating union; for the predisposition is as often given by the male as by the female parent. If the tuberculous diathesis be induced during intra-uterine existence, it belongs to the class of acquired predispositions.

As respects children, born with a predisposition to tubercle, or who may have acquired the predisposition, although we are unacquainted with any direct remedies for it, we can frequently correct it indirectly, —by placing the child under circumstances most favourable to health; giving it proper nourishment with free exposure to air, under precautions that will always suggest themselves, and by proper exercise, warm clothing, and due attention to the removal of every source of irritation that may arise. After the period of puberty, when the danger of tuberculous development is shown to be great, the same system must be pursued; with frequent friction of the surface; warm bathing; exercise in the open air, especially on horseback, or on the water, and appropriate exercise of the respiratory organs, so as to expand the chest, and insure the full play of the lungs,—as by taking deep and frequent inspirations; gymnastic exercises, which employ the muscles of the arms and chest; reading aloud, and public recitation under prudential restraints. Some, who have been predisposed to phthisis in early life,—amongst whom may be named Cicero and Cuvier,—have ascribed their exemption from pulmonary disease to the increased strength which their lungs acquired in public speaking. (See the author's *Human Health*, p. 386.)

It need hardly be added, that great caution is needed in the adaptation of both general and local exercise to the particular case: and in all cases the use of instruments, which interfere with the healthy play of the respiratory function, must be sedulously avoided.

As regards therapeutical agents to be employed for the prevention of phthisis, so much must depend upon the particular condition of the individual, that it is impossible to lay down any rule of universal, or even of general, application. The practitioner must be guided by general principles of prevention, and there are numerous articles of the Materia Medica, possessed of the most opposite properties, which

may occasionally be demanded. The prophylactics, most to be prized, are such as improve the general health, and of these change of air and of climate, appropriately directed, is, perhaps, the most effective; but as change of climate is to be recommended as a therapeutical measure also, it will be considered under the next subdivision.

It has been already remarked, that Sir Geo. Lefevre ascribes the less frequency of tubercular phthisis in Russia, to the inhabitants protecting themselves more against the cold. Under such views, he, of course, strongly inculcates the necessity of warming equally the whole house, and especially the passages—which are too often suffered to be so cold as to distress greatly the phthisical invalid—and of proper protecting raiment.

Some experiments on the influence of different agents in preventing the development of tubercles have been recently made by M. Coster, and the details thereof laid before the Académie Royale de Médecine of Paris. He experimented upon dogs, rabbits, guinea pigs, and fowls, which he subjected to the most injurious hygienic influences; and to combat these administered iron, baryta, iodine, bromine, mercury, and tannin. The agent which always succeeded with him in the prevention of tubercles was a ferruginous bread, composed of half a drachm of the subcarbonate of iron to a pound of bread. A quarter of a pound of the bread was taken in the day.

The state of the grinders at Sheffield and elsewhere attracted great attention many years ago, and numerous attempts were made to obviate or diminish the insalubrious character of their occupation. An invention of Dr. Calvert Holland, it is asserted, after a trial of years, is equal to the thorough correction of the evil. "A wooden funnel," says Dr. Holland, "from ten to twelve inches square, is placed a little above the surface of the revolving stone, on the side farthest from the grinder, and this funnel terminates in a chimney immediately under the surface of the floor; or we may consider the channel simply as the continuation of the funnel, in order to avoid any confusion in the explanation. The channel varies in length, according to the situation of the grinder, in reference to the point where it is most convenient to get quit of the dust. If we suppose that eight or ten grinders work in the same room, each has his own funnel and channel, and they all terminate in one common channel, the capacity of which is perhaps twice or three times as great as each of the subordinate or branch channels. The point where they terminate is always close to an external wall. At this point, within the general channel, the fan is placed, somewhat in form like that used in winnowing corn, and to this is attached a strap, which passes upwards, and over a pulley, so that whatever puts the pulley in motion, causes the fan also to revolve. The pulley is placed in connexion with the machinery which turns the stone, so that whenever the grinder adjusts his machinery to work, he necessarily sets the pulley and the fan in motion. The fan, acting at this point, whatever may be the length of any of the subordinate channels, causes a strong current to flow from the mouth of each funnel, which carries along with it all the gritty and metallic particles evolved, leaving the room in which the operations are pursued free

from any perceptible dust. When the whole apparatus is perfect and in excellent condition, the atmosphere is almost as healthy as that of a drawing-room."

b. *Therapeutical Treatment.*—This is, unfortunately, difficult and unsatisfactory. When the disease is once fully formed, it is generally beyond the efforts of art; still, it must be borne in mind, that cicatrization of cavities is sometimes effected.

In the earlier periods of the disease, the practice, with many, has been to employ small and repeated bleedings; and the same course has even been pursued in the confirmed stage. Dr. Dovar was in the habit of bleeding to the amount of six or eight ounces every day, for the first fortnight, and of increasing the interval between each repetition of the operation, by employing it at the respective periods of every second, third, and fifth day, for the three successive fortnights; and the employment of small bleedings, although by no means to the same extent, has been advocated by others. That symptoms and complications may arise, which may demand general bloodletting, cannot be doubted; but to expect to remove tuberculosis by it is a great error. We feel satisfied, indeed, that much mischief is done by its indiscriminate employment, and that nothing is more likely, in many cases, to confirm the tubercular cachexia. At the same time, when the symptoms indicate the employment of the lancet—when inflammatory action or hyperæmia of the pulmonary tissues, is associated with the disease,—it cannot be pretermitted.

Throughout the whole course of phthisis, local bloodletting by cupping or by leeches, practised with the view of removing accidental inflammatory or hyperæmic complications, may be had recourse to with marked benefit. Moderate local bloodletting by leeches below the clavicles has been recommended, whenever increase of pain, or cough, with a bloody tinge of the sputa, &c. indicate a hyperæmic or congested state of the lung, around the suspected indurations. In such cases, it is probable, that the local bloodletting acts rather as a revellent than as a depletive. It is, indeed, on revellents, that the hopes of the practitioner—slight as they may be—must mainly repose for the cure of phthisis.

Revulsion on the chest may be used in all stages of the disease—more care being demanded during the early periods, that too much irritation be not induced. Intermittent revulsion is preferable to the constant, in which latter class may be ranked the perpetual blisters, issues, setons, &c., which do not act by the discharge they induce, but by the counter-irritation. The author is in the habit of employing tartrate of antimony and potassa, in the form of ointment, or of saturated solution, which may be rubbed in below the clavicles, twice a day, until the peculiar eruption is induced. The friction is then to be discontinued, but it must be renewed as the crop of pustules disappears; or a fresh place may be selected, so that a new crop may be presenting itself as the former is fading. In rare cases—one of which is at present under the author's care,—the tartarized antimony induces much gastric uneasiness. The croton oil may be substituted, either rubbed on pure, or mixed with olive oil.

℞.—Ol. tiglii, p. i.
Ol. oliv. p. ij.—M.

The iodide of potassium has been added to the saturated solution of the tartarised antimony, with the effect of rendering it more irritating, and, perhaps, according to Dr. Williams, of acting favourably on the constitution, by being partially absorbed. Issues and setons are considered to cause too much irritation of the system to be useful in the early stage; and in our view, their place may be supplied beneficially, in all stages, by the more efficacious and more cleanly applications.

Some practitioners prefer one revellent and some another;—blisters, applied from time to time; ammoniated liniments, of various degrees of strength; moxas; sponging the whole chest, once or twice a day, with salt and brandy, or strong vinegar, or with the *linimentum cantharidis* of the U. S. Pharmacopœia—which consists of oil of turpentine and cantharides—or with a liniment of oil of turpentine and acetic acid, as recommended in bronchitis.

℞.—Ol. tereb. f℥iij.
Acid. acetic. f℥ss.
Vitell. ovi.
Aq. rosar. f℥iiss.
Ol. limon. f℥j.—M.

It was on the employment of active revulsion, that the notorious St. John Long attained so much reputation as a curer of pulmonary consumption. Dr. Evans, physician to James' Street Hospital, Dublin, was connected with him in early life. He is inclined to think, that the value of the mode of treatment by excitant liniments is much underrated, and that the fatal cases, which occurred under St. John Long's hands, were owing to his want of discrimination in the application of his powerful frictions, and not to their inherent unsuitableness to the nature of the disease. Dr. Evans prefers the liniment of oil of turpentine and acetic acid, given above, croton oil, or the ointment of tartrate of antimony and potassa, and he particularly urges the necessity of applying them extensively.

One objection to the use of many of these agents is, that they interfere with the physical diagnosis; but they may be so managed, in all cases, by the selection of proper parts of the chest, as to obviate this in a great measure.

Recently, Dr. Marshall Hall has inordinately extolled the efficacy of an alcoholic lotion, kept constantly applied by means of six folds of linen, over and across the region of the upper lobes of the lungs, for checking the deposition and softening of tubercles in the lungs. The lotion is composed of one part of pure alcohol and three parts of water. It is used tepid at first, and afterwards of the temperature of the atmosphere, and is applied in small quantity at a time every five minutes, so that the application may always consist of alcohol and water. If applied in larger quantity, and less frequently, the alcohol would evaporate, and water alone would be left, which "would be the source of a feeling of discomfort instead of the feeling of glow, which the alcohol induces." A piece of soft linen, of the size of a very *large* sheet of letter-paper, is folded so that the whole consists of six folds. These are stretched, applied across the upper part of the chest just

below the clavicles, and fastened to the shoulder-straps, or other part of the dress, which latter is to be arranged so as to be readily opened and closed. A sponge, of the size of a walnut, is then filled with the lotion, and pressed upon the linen along its whole course, the dress being opened for this purpose and immediately closed. This operation need not occupy five seconds. It should be repeated every five minutes during the day and waking hours, the dress being light, or even wholly removed, so as to allow of free and rapid evaporation. It is suspended during the night. Dr. Hall says, that it is by no means his wish to laud this remedy beyond its just value; but he has "no hesitation in asserting, that it possesses a power in checking the progress of the deposition and softening of tubercle in the lungs, beyond any other" which he has ever tried. Yet notwithstanding this eulogium, its efficacy must be exceedingly limited.

Purgatives and emetics have been highly extolled by many writers. Their beneficial agency, also, is probably altogether revellent. An objection—urged against the former—is, that as the intestines are disposed to inflammation, purgatives may hasten or exasperate it; but a more important objection is, that their imprudent use—by deteriorating the general health—may add to the tubercular mischief. They are now rarely employed, except under circumstances in which they would be had recourse to in most diseases—viz. as simple evacuants. Emetics were, at one time, regarded as specifics in phthisis; and a great majority of the reputed cures of consumption, related by different authors, have either been ascribed to emetics, or to decidedly nauseating remedies. The practice has been sanctioned by many therapeutists. Sir James Clark, who is an advocate for the use of emetics, supposes their action to be, in a great measure, mechanical, by destroying the tuberculous matter, which, according to Dr. Carswell, is first deposited on the free surface of mucous membranes. Emetics, Sir James conceives—may remove this deposit, by the succussion they give to the lungs; and thus may "prevent the *localization* of the disease, and give time for the correction of the constitutional disorder." The examinations of the author, however,—as elsewhere stated,—have by no means led him to agree with Dr. Carswell as to the primary seat of tubercle; and, besides, this explanation of the modus operandi of emetics must be regarded as entirely too mechanical. The main salutary agency has appeared to the author to be ascribable to the revulsion, which they operate; and hence the advantages of sea-sickness, united—as it usually is—with the revulsion, which a thorough change of the physical and moral influences around the individual is capable of effecting.

Different emetics have been recommended. Some give half a grain of the tartrate of antimony and potassa, and repeat it in fifteen minutes, if necessary. Others use ipecacuanha, or the more direct emetics,—sulphate of zinc or sulphate of copper. The repetition of the emetic,—according to the author last cited,—must be regulated by the nature of the case. When it is given with the view of preventing the deposition of tuberculous matter, it may, perhaps, be sufficient to repeat it once or twice in the week. When the case is more urgent, and the

patient threatened immediately with the deposition of tuberculous matter in the lungs, or when the presence of such matter is already suspected, emetics, he remarks, may be much more frequently repeated; but, in all cases, it will be necessary to watch their effects on the gastric system, and to suspend their use, should they appear to excite irritation there. It will be readily understood, that their indiscriminate employment may tend rather to develope the mischief they are intended to prevent. Owing to this cause and to their unmanageable character, they are not much employed, notwithstanding the high authority adduced in their favour.

The tubercular depositions themselves, as well as the morbid consolidations, could not fail to suggest the use of some agent, which might be regarded as possessed of properties to modify the condition of the system of nutrition. The efficacy of iodine in the removal of bronchocele, and in certain strumous affections, naturally gave rise to the belief, that it might be serviceable in tuberculosis. In mesenteric tubercles, it is affirmed to have been given with success. It has also been much used in pulmonary tubercles by many practitioners, and, according to some, with the effect of removing the tubercular depositions. The experience of most practitioners has, however, shown, that it is of no marked advantage, even in the incipient stage of the disease,—the stage in which, alone, much good is to be expected from any remedy. The author has used it to a considerable extent, especially in public practice,—in the form of the ioduretted iodide of potassium,—which, by the way, is as valuable a form as any,[a]—in that of the iodide of potassium,—of the tincture of iodine; of the iodohydrargyrate of potassium, the iodides of mercury, &c.; but the most careful and unprejudiced examination has not enabled him to say, that any beneficial effect was induced, which could be unhesitatingly referred to these preparations. In the Baltimore Infirmary, and the Philadelphia Hospital, it was a question of interest with both physician and student to determine this point; and such, unfortunately, was the negative opinion formed.

[a] ℞.—Iodin. ℈j.
Potassii iodid. ℈ij.
Aq. destillat. f℥vij.—M.
Dose, 10 drops, three times a day, in sugared water.

Codliver oil—*Oleum jecoris aselli*—which contains, it is affirmed, a minute quantity of iodine, and which has been highly extolled in scrofula, has been given in tuberculosis, and, it is asserted, with advantage. The dose to an adult is from half a spoonful to three spoonfuls, two or three times a day, in coffee or with lemon juice, or in the form of emulsion. Of its effects, the author has had no experience. It is an extremely nauseous article.

Alkalies have frequently been recommended in tuberculosis of the lungs; and they have been brought forward with high encomiums by a recent writer, Dr. J. S. Campbell. He recommends the liquor potassæ, in the dose of f℥ss. to f℥j., three or four times a day in milk or water; care being taken, that no medicine which might convert it into a salt is prescribed simultaneously, and that it is persevered in for a long

time. With the same view of dissolving the albumen, which is conceived to form the greater part of tumours and engorgements of all descriptions, M. Pascal, of Strasburg, has advised the subcarbonate of potassa. The muriate of ammonia has also been highly recommended by Dr. Cless, of Stuttgart, in incipient tubercle, whilst yet in a crude state. The majority of his patients took from about six ounces to eight within a period of from a fortnight to a month. A few years ago Dr. John Hastings first urged upon the profession the use of naphtha in these cases. He was led, he says, to adopt it from chemical considerations. From the greasy nature of tubercle, in its crude state, he concluded, that carbon entered largely into its formation, and that its composition had a striking resemblance to fatty matter. Among the changes in the earlier stages of pulmonary consumption, the disappearance of the fat is one of the most remarkable. In consequence of this loss of fat, Dr. Hastings determined to employ those compound agents, rich in carbon and hydrogen, which had not been previously used in medicine; "not with the idea that they would make up the deficiency, which the system had sustained in the progress of the disease, but that such a change would by that means be introduced into the constitution as would act upon the forces of the organism at the point of departure from health, whether that took place in the stomach, blood, or elsewhere; that change tending to such an affinity in the elements within the body, that the carbon, hydrogen, oxygen and nitrogen, instead of assisting in the formation of products which threaten life, would tend to develope those materials only which are required for the perpetuation of health, and the prolongation of existence." Under these views, Dr. Hastings was led to employ naphtha,—the kind termed *pyro-acetic spirit*, obtained by the destructive distillation of an acetate, and in its outward form scarcely distinguishable from *pyroxylic spirit*, being that which he considers best suited for this purpose. He prescribes it three times a day, in doses of fifteen drops for an adult, mixed with a tablespoonful of water, which is proportionably decreased according as the patient approaches youth. After the second or third day, the dose is augmented by one-fourth,—regulating its increase or decrease according to the increase or decrease of nausea, vomiting, or any other outward symptom referable to its use. As the disease advances, the dose is increased to forty and even fifty drops, and it is administered four times a day instead of three. The naphtha was also used in the form of inhalation. The author has had opportunities for testing the value of the naphtha. As a eutrophic, it may rank with codliver oil, and some of the other articles that have been mentioned; and as an excitant expectorant may be ranked with creasote and the balsams; but farther benefit cannot be expected from it.

Contrary to the sentiments of most members of the profession, mercury, pushed to salivation, has of late been advised, on the authority of Dr. Graves, for the cure of incipient phthisis; and several cases, it is affirmed by Drs. Stokes and Munk, were thus treated successfully, which would in all probability, have ended in confirmed phthisis. Dr. Stokes properly remarks, however, that he is anything but sanguine regarding the general employment of mercury in incipient phthisis;

and that "the remedy is a two-edged sword, and its exhibition must not be lightly attempted." It is, indeed, "*anceps remedium.*" In confirmed phthisis, nothing can be expected from it: generally, in this stage, the powers of the system requiring support under the extensive suppuration and irritation. This can be best afforded by appropriate diet; but it may be aided by any of the vegetable tonics, of which the *Prunus Virginiana* (*Infus pruni Virginian.* f ℥iss. three times a day,) is one of the best. It is presumed to possess sedative as well as tonic properties, and it certainly enjoys the latter. The iodide of iron,—either alone, or taken at periods distinct from the Prunus Virginiana,—is also a useful preparation (*liq. ferri iodidi*, gtt. xx. three times a day); and has been strongly recommended by M. Dupasquier of Lyons. M. Louis, however, states, that he had administered it to upwards of sixty patients labouring under phthisis in all its various stages, and in no single case did he observe any improvement which could be ascribed to it. It is obvious that these agents can only act as palliatives.

The author would scarcely have deemed it necessary to mention the treatment of phthisis by chloride of sodium, so strongly urged by M. Latour, had it not been considered worthy of notice by M. Louis. The plan consists almost solely in giving the chloride for two or three months in succession, in gradually increasing doses, of from half a drachm to two drachms daily, either in broth, or mixed up with bread —its tonic action being aided by a succulent diet and mild bitters. In the year 1839, M. Louis prescribed it for every phthisical patient admitted, for five successive months, into his wards at the Hotel-Dieu; but in not a single one did he observe any appreciable effect,—certainly none of amelioration "that could by possibility be ascribed to it." As substances can be readily made to come in contact with the whole of the air-tubes along with the air of inspiration, inhalations naturally suggested themselves in the treatment of phthisis. Of dry fumigations, with resinous and balsamic substances, and with tar, the author can say little from experience. It is not easy to conceive, however, that they can be of much use. The vapour of tar was at one time highly recommended. It is diffused through the patient's chamber, by heating the tar to gentle ebullition, with a little carbonate of potassa, to retain the irritating pyroligneous acid. In chronic bronchitis, the application of a gentle excitant to the vessels themselves, which are concerned in the secretion, may be, and often is, beneficial; but in that disease, there is no adventitious product to be softened and broken down as in incipient phthisis. Under Chronic Bronchitis, allusion has been made to the effect produced by the internal use of both tar-water and creasote, and to their agency in phthisis also. The results of trials with both these agents in the latter disease have been discordant. The inhalation of aqueous and medicated vapours is not more advantageous, and they by no means compensate for the labour necessary in the process. It has been properly suggested, however, that when the air of the chamber is too dry, advantage may be derived from placing a basin of warm water near the patient. Chlorine has been much used in the way of inhalation, and, according to the testimony of some, with advantage. The experiments with it, instituted at La Charité and the

Hôtel-Dieu, of Paris, as well as the testimony of different observers, are not encouraging. It produced increase of bronchial irritation, and arrested the pulmonary secretion. Chlorine, like iodine, may be inhaled from a common dish or inhaling apparatus, by dropping any of the acids on a mixture of chloride of lime, so that the chlorine may be disengaged slowly; but the best method is by the apparatus devised by Dr. Corrigan. (*New Remedies*, 5th edit. p. 166. Philada. 1846.) The inhalation may be repeated twice a day or oftener. Iodine has also been recommended in the form of vapour. The addition of a little tincture of conium was found by Sir Charles Scudamore to be beneficial in subduing the irritating qualities of the gas. His formula is the following:—

R.—Iodin. gr. viij.
Potass. iodid. gr. iij.
Alcohol, f℥ss.
Aq. destillat. f℥vss.—M.

Of this solution, from one drachm to six, and from 20 to 35 minims of a saturated tincture of conium are used in each inhalation, which is continued from 30 to 40 minutes. Sir Charles considers it better to add the conium at the time of employing the inhalation. At the temperature of 90°, the volatile properties of iodine are given off very sensibly, but the conium requires more heat, and the temperature of 120° is not too much for the iodine.

The author's experience is not favourable to the iodine in this form, and such has been the case with that of others. It has been suggested by Mr. A. Leigh, to apply a sufficient quantity of iodine ointment over the ribs, and under both axillæ, and to cover the head with the bedclothes, in order that the iodine, volatilized by the heat of the axillæ, may be breathed. This method is stated to have arrested the progress of the disease. None of these agents can, however, be expected to afford much benefit. If they modify the local symptoms, it can only be to a slight extent, whilst they leave the tuberculous constitution unchanged. Too often, indeed, all that can be done is to palliate the distressing symptoms.

One of the most judicious therapeutists of the day, M. Trousseau, has advised the employment of the arsenious acid in phthisis, in the way of inhalation. The remedy is not new,—the sulphuret of arsenic having been administered in fumigation centuries ago. M. Trousseau recommends that the arsenious acid should be used in the form of *Cigarrettes arsénicales*, which are made in the following manner:—a sheet of white paper is dipped in a solution of one part of arseniate of soda, and thirty parts of water. The paper is then made into small cigars of the length of a finger, and the patient is directed to smoke one or even two daily, so that the fumes may pass into the lungs. The cigars burn readily, the arseniate facilitating the combustion; and, in this manner, "the empyreumatic oil of the paper is inhaled, united with the metallic arsenic, reduced by the contact of the charcoal formed by the burning of the cigar." M. Trousseau does not pretend to cure pulmonary tubercles by this agent, but he thinks the general symptoms may be so far modified by it as to produce decided improvement in the condition of the patient;—which is questionable.

The cough, when very troublesome, must be met by the remedies laid down under Bronchitis. When there is much accompanying irritation in the early stages, simple mucilaginous or oily mixtures are to be preferred; in after periods, narcotic mixtures become indispensable.

℞.—Mucilag. acaciæ,
Syrup. simpl. āā f℥ss.
Morphiæ sulphat. seu acetat. gr. j.
Aquæ f℥iv.—M.
Dose, a tablespoonful, when the cough is troublesome.

Where opiates disagree, hyoscyamus, conium or belladonna may be substituted. By many, the hydrocyanic acid has been highly recommended, alone, or united with opiates.

℞.—Acid. hydrocyan. medicin. ♏xij.
Morphiæ sulphat. seu acetat. gr. j.
Syrup. f℥ss.
Aquæ f℥v.—M.
Dose, a tablespoonful, three or four times a day.

When these agents fail, two or three leeches, applied over the larynx or trachea, will, at times, prove successful; and in some chronic cases, Dr. Stokes asserts, that he has found the common antispasmodic mixture of camphor, valerian, opium, ammonia, and ether give the greatest relief,—doubtless, by the new impressions which these agents occasion in the manner of all reputed antispasmodics and expectorants, that are possessed of excitant properties. He cautions the practitioner, however, to be careful in the employment of remedies, that may check expectoration, "as it is the natural relief of the lung;"—a pathological view, which may be questioned; although all may be disposed to admit, that the new irritation, induced by improper excitant agencies, may be prejudicial. As to the modus operandi of reputed expectorants, the author's views have been expressed elsewhere. They are all relative agents, and must be adapted to the precise morbid condition, which, in one case, diminishes, and, in another, augments, beyond the due bounds, the secretion of the materials that constitute the sputa.

Messrs. Ballard and Garrod think they have diminished the excessive expectoration of phthisis by the administration of gallic acid, which may be given in the dose of a grain or two, three or four times a day; and Sir James Eyre and Mr. Lane advise oxide of silver in the dose of half a grain twice a day.

The pain, frequently experienced in some part of the thorax, may be met by a small bleeding from the arm, or by leeching, or cupping —with or without the scarificator, according to the case: or simple revellents, as sinapisms, or a burgundy pitch plaster, or one to which cantharides or tartarized antimony has been added, may be applied over the seat of pain.

The dyspnœa, which appears in exacerbations, is, in part, a nervous phenomenon, and must be treated either by narcotics, which overpower the nervous erethism, or by excitants, which induce a new impression, and thus act as antispasmodics;—for example, by sinapisms to the chest; and the preparations of ether and camphor internally.

R.—Sp. æther. sulphuric. comp. f℥iij.
Morphiæ sulphat. seu acetat. gr. j.
Mist. camphor. f℥vss.—M.
Dose, a tablespoonful, when the dyspnœa is urgent.

In cases of acute phthisis, where the skin is constantly warm, and the pulse exhibits permanent excitement,—in addition to general antiphlogistic treatment, and ablution of the arms with tepid water, digitalis has been proposed; and, at one time, its efficacy was thought to be undoubted in phthisis in general. It is difficult, however, to pronounce a decided opinion upon its agency in this disease, but the very difficulty shows, that it has been probably greatly overrated—in many instances at least. The author has employed it extensively in public and private practice; but although the pulmonic symptoms have appeared to be suspended whilst the system was under its peculiar influence, he is not aware of a single case in which it seemed to produce permanent benefit; and the same may be said of the tinctures of lobelia and colchicum. They seem to be indicated, where there is unusual excitement, which they are well adapted, with other agents, to reduce.

Where the hectic fever returns, with distinct chills every evening, an inducement is given to attempt to arrest them by the preparations of cinchona. The author has seen this practice followed; but his experience has been the same as that of M. Andral; the chill has been removed, and perhaps the violence of the exacerbation diminished, but the heat and sweats have nevertheless persisted.

When hæmoptysis is present, the treatment will of course vary according to circumstances. The general mode of management has been given elsewhere, and need not be repeated.

For the colliquative sweats, many remedies have been proposed; chiefly belonging to the class of astringents,—mineral and vegetable. As the extent of the sweating is dependent upon that of the previous febrile exacerbation, attention must be paid to moderate the latter—by the cooling regimen; sleeping in a cool, airy apartment; changing the body and bed linen; avoiding diet of too stimulating character, and, wherever it is practicable, permitting the patient to have the advantage of the open air during the day. Dr. Stokes strongly "denounces the attempt to moderate the hectic sweating by medicines merely, without attention to other circumstances." The sweating, like the other symptoms of hectic, is but a symptom—an effect—which cannot be combated directly; and hence none of the remedies proposed could be expected to afford much benefit. The author has employed the acetate of lead—the dilute sulphuric acid, alone, or combined with laudanum, and the various astringents, recommended, but the results have not been more satisfactory than those obtained by others. In recent times, the *boletus laricis* has been administered in these cases, and has received the favourable testimony of many therapeutists. It may be given in the form of pill,—three grains, three times a day. M. Andral was at one time disposed to speak favourably of it; but more recently he has affirmed, that no great advantage has appeared to him to have resulted from it. Messrs. Ballard and Garrod

strongly recommend gallic acid, and Mr. Lane and Sir James Eyre the oxide of silver in the doses mentioned above.

Colliquative diarrhœa generally supervenes at so late a period of the disease, as to render all active treatment unadvisable. It is truly an inflammatory condition of the lining membrane of the intestines, which soon terminates in ulceration. It may be controlled by attention to diet; allowing only mucilaginous and farinaceous aliments; and, in the early stage, by the ordinary cretaceous and opiate medicines advised in diarrhœa. Should these fail, the mineral astringents—acetate of lead, or nitrate of silver—with or without opium,[a] may be administered, and injections of starch and laudanum, or of infusion of catechu and laudanum, may be given twice a day, or, if necessary, after every liquid evacuation. The infusions of catechu and kino may, likewise, be administered internally, in the same cases.

[a] R.—Plumbi acetat. gr. ij. seu
Argenti. nitrat. gr. j.
Opii gr. ¼.
Ext. gentian. gr. ij. fiat pilula.
Dose, one, three or four times a day.

When these agents have failed, the most marked advantage has been derived from the application of a sinapism or a blister to the abdomen. The blistered surface may be sprinkled with the sulphate or the acetate of morphia.

It remains to speak of a mode of revulsion, which is one of the most important that can be advised in phthisis—the new impressions made on the system by change of air and of climate. If the circumstances of the patient do not permit him, in the early period of the disease, or even before it manifests itself—except by his known tuberculous constitution—to leave the situation, which he inhabits, for another, he should endeavour to take, daily, such exercise as he is able, short of inducing fatigue. If he be the resident of a town, let him seek the air of the country during the day, and return, if compelled, to the city at night; but if he be capable of changing the whole of the circumstances surrounding him, he ought not to hesitate to migrate—especially during the winter—from the temperate regions of the globe to a more genial clime. Even in the confirmed stages of phthisis, where the excavations are small, and the disease probably limited, and not progressive, benefit may accrue from this course; but in the generality of cases of confirmed consumption, it is the height of cruelty to expatriate the sufferer, and to send him away to die far from his friends, his comforts, and his home. Even in the slighter cases, little or no benefit is to be derived from a brief expatriation; and it is of importance to impress upon the mind of the patient and his friends, that if the measure is to be attended with favourable effects, it ought to be continued for several successive years, in order to produce a full and permanent influence upon the constitution. "In a case," says Dr. Stokes, "with a cavity, yet in which the symptoms and signs are not progressive, the patient's best chance, I believe to be, the use of the seton and travelling. If he does not recover, his life will probably be prolonged. He should take as little medicine as possible; he should adopt all strengthening means, and use such a regimen as experience points out as the best. Heated

rooms, cough mixtures, acid draughts, inhalations, narcotics, 'repeated counter-irritation,' and all the varied and harassing treatment, which ignorance supposes to be curative—these are not the means of recovery. So long as a drain from the chest does not weaken, it is clearly useful, and all the other means should be calculated to give enjoyment to the mind, and to strengthen the body. The patient's winter residence should be, if possible, in a temperate climate; but his occupation in the summer and autumn months, should be travelling. The temperate, and even colder countries, may be visited with advantage." There is no doubt of the general truth of these observations, but the intelligent writer will find, if he employs the "repeated counter-irritation," to which he objects, that it is infinitely less harassing, and more effectual, than the seton, which is at all times a most uncleanly and inconvenient accompaniment.

So satisfied is the author, that the good effects of change of climate are altogether dependent upon the revulsion produced on the *physique* as well as the *moral*, that instead of selecting a situation for the brumal retreat of the invalid, which has equability of temperature as its sole recommendation, he would rather choose one, the temperature of which may be less equable, provided it be not too elevated, as in the torrid regions, or provided the air be not damp. The great object is to select one, in which the phthisical valetudinarian can take exercise with safety in the open air, every day during the winter; and the nearer the climate approaches this desideratum, the better it is for the consumptive. In such an atmosphere, the patient ought to be as much in the open air as possible, and take exercise, both by walking and riding, short of inducing much fatigue.

It was supposed of old, and the opinion is still entertained by many of the people, that the fall of the year is the season at which phthisis is most fatal; but statistical inquiries into the number of consumptive patients received into the different establishments for the sick at different seasons, and into the comparative mortality of these seasons, show that spring is by far the most dangerous season. Careful observations made in the large cities of Europe, exhibit, that the maximum number of deaths of phthisical patients is in the spring, and next to this in winter; whilst the minimum of deaths is in summer and autumn. For this reason, says Dr. Casper, of Berlin, it is the practice with physicians in England and on the continent of Europe—and the same applies to this country—to send their patients to pass the winter in a milder climate.

Of the places abroad, which are esteemed eminently adapted as sanitaria for the consumptive, Madeira has the favourable testimony of most persons. In Italy, Rome, Pisa, and Nice are preferred; but no part of Italy is considered to be appropriate during summer. The islands of Hyères, being sheltered from the north wind, are much frequented. "The south of France," says a competent observer, M. Andral, "ought only to be recommended as a winter residence; for the summer there is fatal to the consumptive. Avoid Marseilles, the whole shore of the Mediterranean; avoid Montpellier, Pau, and Bayonne." In England, Penzance, Torquay, Undercliff (in the Isle of Wight), Clifton, Hastings, St. Leonards, and Brighton, have been recommended,

and, within the last few years, Cove, in Ireland, has attained great celebrity. In equability of temperature, the Cove of Cork would, indeed seem to be surpassed by but few places. Observations, according to Dr. Stokes, have shown, that the mean difference of days and nights rarely exceeds four or five degrees, and often, in the winter months, does not exceed one degree. The town is completely sheltered from the north wind, and owing to its southern exposure receives the full influence of the sun and the southern breeze. The climate of Algeria —it has been affirmed—is exceedingly favourable to the phthisical valetudinarian. According to M. Moreau, who was at the time physician to the French army of Africa, among 6245 patients, 12 only figured as attacked with consumption; and in 250 deaths there were but 6 from that disease. His experience, indeed, warrants him in deducing,—*first*, that consumption is extremely rare amongst the inhabitants: *secondly*, that Europeans are rarely affected by it; and *thirdly*, that the progress of the disease is retarded in consumptive Europeans who reside in Africa. M. Boudin, also, affirms, that of 12,853 patients whom he has treated, either in the army of Africa, or at the Lazaretto of Marseilles (after their return from Africa,) he has met with only 31 cases of consumption, of which 25 had incontestably been previously affected with tuberculosis. Still more recently, M. Casimir Broussais has stated to the *Académie Royale de Médecine*, of Paris, that the mortality amongst the civil population of Algeria is 1 in 15, whilst in Paris it is 1 in 5; amongst the Jews, the mortality is 1 in 56; and amongst the Arabs and Turks, 1 in 20, as far as could be ascertained. In combating the objection, that individuals dying by fever and dysentery might, had they lived, been subsequently carried off by phthisis, M. Broussais added, "that tubercles, even in a crude state, are never found in Algiers in patients dying of any other disease than consumption."

It has long been remarked, that marshy countries, which are favourable to the production of intermittents, are unfavourable to the production of phthisis; and hence, amongst the prophylactic remedies against the latter disease, it has been advised to send patients to localities where intermittents prevail,—for example, to the isles of Hyères; the neighbourhood of Pisa and Rome; the Ionian isles; the shores of the Morea; the neighbourhood of Cadiz; South Holland; the aguish districts of England, &c. &c. It has been remarked, also, by M. Boudin, that the comparative immunity from tubercular phthisis in Algeria prevails only on the sea-coast, where it is marshy. The doctrine of the antagonism between intermittent and phthisical localities has not, however, been universally admitted; and, indeed, has been combated by MM. Bonnefonte, Levy, Forget, Gintrac, Gouzee, Schedel, and others. M. Bonnefonte asserts, that at Rome the ratio of persons who die of phthisis is nearly equal to that of Paris. M. Levy also stated to the *Académie*, that at Strasbourg, surrounded by marshes, phthisis and intermittents prevail; and that he had met with various instances of phthisis in the marshy lands of both Corsica and Greece. In regard to the prevalence of the two diseases at Strasbourg, it was asserted, at a subsequent meeting of the *Académie*, by M. Boudin, that whilst he acknowledged the prevalence of both phthisis and intermit-

tents at Strasbourg, the precise localities of their origin appeared to be different,—one being endemic only in the marshy districts without the walls, and the other in the citadel alone. The results of M. Genest's examination of the reports of Major Tulloch and Mr. Wilson on the sickness and mortality of the British army, at home and abroad, are opposed to the view of M. Boudin, as will appear from the following table, showing the relative number of cases of phthisis and intermittent received into hospital.

	Intermittent.	Phthisis.
United Kingdom,	2·0 per 1000.	6·5 per 1000.
Gibraltar,	5·0 "	5·6 "
Malta,	7·5 "	6·0 "
Ionian Islands,	132·0 "	5·0 "
Canada,	78·0 "	5·6 "
Nova Scotia,	0·8 "	7·0 "
Bermuda,	2·5 "	8·8 "
Western America,	250·0 "	9·5 "
Jamaica,	85·0 "	13·0 "

Sufficient testimony has been afforded to show that some marshy situations where intermittents prevail are much more exempt from phthisis than other situations in which intermittents are unknown.

In point of climate, the Bermudas and the Canary Islands would appear to approach nearest to that of Madeira. To the climate of the West Indies Dr. Stokes has strong objections. That of Santa Cruz especially, has, however, been recommended by many. Perhaps, in the territory of Florida, situations may be met with, which possess every advantage, so far as regards atmospheric influences, which the valetudinarian could desire; and if it be granted, that there are objections to St. Augustine on the score of the northeast storms to which it is liable, these objections do not equally apply to Pensacola, Mobile, and to places in the interior. In regard to St. Augustine and Pensacola, Dr. Chapman states, that no comfortable accommodations are to be had in either—which is somewhat strange; and that "they are less suited from their proximity to the seaboard." He thinks there is the least objection to a short distance within South Carolina or Georgia; and is induced to believe, from what he has heard, that the town of Athens, in the latter state, offers great advantages. Savannah, he adds, has hitherto been his choice when called on to decide peremptorily;—yet Savannah must be strongly liable to the objections which he brings against Pensacola, inasmuch as it has, in addition, the northeast storms, which have been considered to render St Augustine an unsuitable winter residence for the pulmonary invalid;—but, on the whole subject of the climates best adapted for the annual retreat of the phthisical valetudinarian, the reader is referred to another work by the author (*Human Health*, p. 144, Philadelphia, 1844.)

The remarks, thus far made, have relation to the course to be pursued by the valetudinarian during the winter. It is often, however, an important subject of inquiry to decide as to the course to be pursued by him during the summer season. Where the mischief is incipient, there is nothing perhaps comparable to the revulsion, which the change of physical and moral influences, during a sea voyage, is capable of effecting; and even in the more advanced stages, life has

appeared to be prolonged by it. The facilities are so great for crossing the Atlantic, that a sea voyage to Europe is easily undertaken, with every comfort provided that is practicable; and from the commencement of May no countries perhaps could afford greater advantages for a summer journey, and a temporary residence, than Great Britain or France. The invalid can remain some weeks in either, and return to his own country before the autumnal vicissitudes are experienced to any extent, so that he may be ready to make any arrangements that may be advisable for the winter. So salutary has been the influence of sea voyages in consumptive diseases, that it has not been esteemed an idle or foolish proposal to have a ship fitted out for the express purpose of taking phthisical invalids to sea, and keeping them there for months or even years.

Next to a sea voyage during the summer, travelling by land, through different parts of this country, may be recommended; and now that the distance between different places has been so much reduced by railroads and steam navigation, a thorough change of atmospheric influences—barometric, hygrometric, thermometric, &c. —can be speedily obtained, with all the other advantages of change of society and scenery, attendant upon travelling exercise. The physician must, however, use his best judgment in adapting his advice to the particular case, employing special caution where the excavations exist to any great extent. Pamphlets have appeared strongly recommending the Red Sulphur Springs of Virginia to the invalid during the summer season; and in many pulmonary affections, in which change of air, scenery, and appropriate mineral waters are indicated, few situations appear to offer more advantages. Possessing a delightful climate, and with accommodations well adapted for the comfort of the valetudinarian, it is an excellent retreat for all those for whom travelling air and exercise are deemed advisable, no matter whether or not its waters may possess the power of diminishing the frequency of the pulse, as is affirmed by some, but denied by other observers. Were they, indeed, possessed of this virtue, they would not be applicable to all cases of phthisis; but where the waters failed, the admirable climate, with all the attendant advantages, would not the less exert its beneficial agency.

Attention has been directed by Professor Drake, of Louisville, to the northern lakes of this country as a summer residence for invalids of the south. A tour to these is said to offer advantages of novelty, great variety, magnificent scenery, a pure cool air, and many interesting historical associations.

In judging of the sanitarium best adapted for the phthisical, it need scarcely be said, that the capability of affording the requisite accommodations must always be considered. It matters not what may be the advantages of climate, unless they can be properly enjoyed.

As a succedaneum for change of climate during the winter season, a regulated temperature has been advised in the apartments of the sick. The best course, perhaps,—where this plan is adopted,—is, to accommodate the temperature to the feelings of the patient. As a general rule, a temperature of 70° to 76° will answer every purpose

The air of the chamber becomes, however, so vitiated, and proper ventilation so difficult in the depth of winter, and there is, withal, so much monotony in everything surrounding the invalid, that more of detriment would appear to arise from these circumstances than of good from the equability of temperature. This has, in part, led to the recommendation of vigorous exercise, and exposure to the air, as the most efficient remedies in tubercular consumption,—the exercise to be pushed so as to amount even to labour, and the patient not to allow the dread of taking cold to confine him on every occasion, when the temperature may be low, or the skies overcast. The general rule should be, to take exercise in the open air, whenever it is dry, and the temperature—even if cool—tolerably equable. The late Dr. Parrish always ascribed his recovery from phthisis at an early period of his life to the adoption of this course; and his impressions were probably just; as, on dissection, evidences of cicatrization of the lung were perceptible. On several occasions, the author has advised this plan, and has never witnessed any disadvantage to accrue from it. On the contrary, the invalid has always appeared to be benefited by the revulsion. At every exacerbation of his complaint,—as Dr. Billing has remarked—he says he has "caught fresh cold," but the same thing happens when he is kept in rooms the temperature of which is regulated by the thermometer.

On the subjects of climate and change of air, the author has entered at length in his *Human Health*, Philadelphia, 1844, and in the article *Atmosphere*, of the *American Cyclopedia of Medicine and Surgery*, to which the reader is referred for further information,—for more, perhaps, than can be readily obtained elsewhere in regard more especially to the best winter retreat for the consumptive.

It yet remains to mention the diet adapted for the consumptive. In the first stage, it ought to be mild and unirritating, consisting chiefly of milk and the various farinaceous aliments; and, if the patient has been accustomed to indulge freely in animal food, it may be allowed in moderation. Always let it be borne in mind, that the pathological state of tuberculosis, as of scrophulosis, when uncomplicated by inflammation or hyperæmia, is simply, perhaps, one of defective and depraved nutrition. As the disease advances, the same kind of diet may be persevered in, subject to modifications to suit the particular case. It has been advised by some, that from the very inception of the disease, the diet should consist of beef-steaks and porter, freely allowed. The author's experience would warrant him in saying, that, as a general rule, a liberal and nutritive diet answers best; but great care must be taken in passing to extremes, and in converting a *general* into a *universal* rule. The jellies of the Iceland moss—*Cetraria Islandica*, and of the Carrageen or Irish moss—*Chondrus crispus*—are bland and nutritious.

℞.—Chondr. crispi ℥ss.
Lactis recent. f ℥ix.
Coque ad. ℥v. et adde
Sacchar. alb. ℥ss.—℥j.
To be taken in the course of the day.

To these, any dietetic or remedial agent may be added, which is considered to be indicated.

Preference has been given to asses' and to goats' milk over that of the cow, and in Europe much expense is often incurred to procure them. There is, however, no sufficient reason for the belief, that they are possessed of any advantages, which cannot be obtained from cow's milk. A notion existed, that the goat should be first of all fed on aromatic plants, but this is now exploded, and properly so. It was also believed at one time, that the white snail, swallowed raw and in quantities, was not only a hygienic but a therapeutical agent in phthisis, and it was brought forward with high pretensions in the 17th century. Except by the unprofessional, it had, however, been almost universally abandoned, when its use was revived recently by a respectable French practitioner, M. Sue. It need scarcely be said, that the only effects snails can induce are those of any gelatinous and mucous aliment; and on this side of the Atlantic, they are considered to possess no advantages that could suggest their employment over less revolting articles of diet.

The free use of chloride of sodium or common salt has been recently recommended very highly in both phthisis pulmonalis and scrofulous affections. Half a drachm to a drachm is directed to be administered daily, either in a glass of beef-tea, or in some pectoral infusion. There can be no question, that the use of salt as a condiment will exert a favourable tonic influence, but nothing farther can be expected from it.

X. DISEASES OF THE BRONCHIAL GLANDS OR GANGLIONS.

The bronchial glands or ganglions are seated around the bronchia, near where they dip into the tissue of the lung. Their colour is almost always black, and with them the few lymphatics, that arise from the superficial and deep-seated parts of the lungs, communicate. The efferent vessels of the glands have been traced into the thoracic duct. It is not uncommon to find these larger than usual, without there being any evidence of their morbid condition during life; and hence it has been concluded, that when hypertrophied, or otherwise diseased, they seldom produce any striking symptoms. It need scarcely be said, that if they are so large as to compress the bronchial tubes, they must interfere with breathing: still, the compression may be made so gradually, as to account for the very slight effect they induced on the breathing, in certain recorded cases. In children, they are frequently greatly enlarged by the deposition of tuberculous matter, and may give occasion to dyspnœa, and evidences of obstructed circulation, of which more will be said presently. Dr. Stokes affirms, that he has never met with any instance of stridulous breathing, or even bronchial compression, produced by their diseased condition; but Dr. Golding Bird, has recorded a case in which death appeared to him to have resulted from the constriction of the left bronchium by two enlarged bronchial glands, which prevented the entrance and exit of air as regarded the left lung:—the right, however, was so full of tubercles as to be incompetent to the task of arterializing the blood. Dr. Bird also

states, that he has seen three other cases in which death occurred in the course of phthisis, where the existing disorganization was not sufficient to account for the fatal termination, and where pressure on the left bronchium existed;—in two, the constriction was produced by enlarged bronchial glands, and in one by an aneurismal tumour.

Tumours of the bronchial glands—it is affirmed—generally grow forwards; and Dr. C. J. B. Williams states, that he has often seen them pushing out the sternum or the ribs on one side, and causing dulness at those parts, and symptoms of displacement of the lung farther down; and that he has known them compress the great bronchia to a fatal extent. This must, however, be an extremely rare occurrence. The author has often known the glands largely hypertrophied in children of scrofulous habits, but there were no signs, that could lead to more than a suspicion, that this morbid state existed. The scrofulous diathesis may be accompanied with tuberculosis of the lungs, and no signs can enable us to pronounce positively, if evidences of compression of the bronchia exist, that such compression is owing to the enlargement of the bronchial glands. These scrofulous enlargements sometimes soften, and are evacuated by ulceration into the bronchia.

Tuberculosis of the Bronchial Ganglions or Glands.—*Phthisis bronchialis, Bronchial phthisis;* Fr. *Tuberculisation des ganglions bronchiques, Phthisie bronchique;* Ger. *Tuberkeln in den Bronchialdrüsen, Bronchialdrüsentuberculose,* has generally received but little notice. The first monograph on the subject was written by M. Leblond, in 1824; and since then it has been described by various writers—MM. Becker, Rilliet and Barthez, Becquerel, Wunderlich, and others; but the remarks of MM. Rilliet and Barthez have furnished the basis of most that has been written since. There is no single symptom that characterizes the affection,—all the phenomena that lead to a suspicion of its existence being the functional alterations, that result from the compression exerted by the diseased ganglions on the neighbouring organs, accompanied by the characteristic phenomena of tubercular phthisis. It has been properly remarked, however, that if a child three or four years old, coughs, becomes emaciated, and has fever, diarrhœa, and night sweats, and shows signs, at the same time, of compression of the vena cava, œsophagus, trachea or bronchia, we may be justified, almost at once, in diagnosticating tubercular degeneration of the bronchial ganglions. Every period of childhood would seem to be equally subject to the disease. Until the age of eleven, it has been observed to be more common in boys than in girls; but at the period of puberty no difference has been noticed. The tuberculosis appears to follow the same course as in the lungs;—the tubercles sooner or later proceeding to softening, or to the calcareous transformation; but this last almost always occupies a part only of the ganglion. In 249 cases recorded by MM. Rilliet and Barthez, the following forms of tuberculous matter were observed; some of them, however, exhibiting several of the forms united.

Minute white or yellow points of tubercular matter, *Poussière tuberculeuse*,	3	Miliary tubercles,	38
		Gray or yellow tubercular masses,	201
		Softened tubercles,	61
Gray granulations,	6	Cretaceous tubercles,	19
Yellow granulations,	10		

The tubercles may vary in size from that of a hazelnut to that of a horse-chestnut, or even of a large apple; for they have been seen of the last size by MM. Rilliet and Barthez. They have been found compressing the aorta, pulmonary artery, and vein, the vena cava superior, and the vena azygos; but most frequently the trachea, principal bronchia, the lung, and at times the pneumogastric nerves and the œsophagus. The ganglions are generally enveloped in a thin cyst, to which a layer of albuminous matter is intimately adherent. When they open into any of the neighbouring organs, it is almost always into the bronchia: in such case the cyst communicates with the pulmonary tissue, and might readily be mistaken for a cavity in the lung. They have been found, however, communicating with the pulmonary artery, and the œsophagus.

The bronchial glands are sometimes, also, affected with encephalosis, and it has been suspected, that encephaloid disease of the lungs generally originates in this way, and spreads afterwards along the vessels into the pulmonary tissues.

If tuberculous disease of the bronchial glands be suspected, it may be treated as recommended under Tubercular Consumption.

CHAPTER III.

DISEASES OF THE PLEURA.

I. INFLAMMATION OF THE PLEURA.

Synon. Pleuritis, Pleuresis, Pleuresia, Inflammatio pleuræ, Empresma pleuritis, Pleuris, Pleuritica febris, Passio pleuritica, Pleurisy; *Fr.* Pleurésie, Inflammation de la Plèvre, Fiévre pleurétique; *Ger.* Brustfellentzünhung, Entzündung des Brustfells.

As the pleura is a serous membrane, the general phenomena and anatomical characters of its inflammation are similar to those of the peritoneum, and of serous membranes in general. The membrane, it will be borne in mind, lines the thorax—*Pleura costalis*,—and is reflected over the lungs—*Pleura pulmonalis*. Some difference, consequently, exists, in the phenomena presented by inflammation of the two portions; and when the disease is seated in the pleura pulmonalis, the phenomena—as in the case of the peritoneum—are modified by the viscus over which the membrane is reflected.

The disease is distinguished into the *acute* and *chronic* forms; and it is sometimes divided into *general* and *partial*, according as the inflammation is seated in the whole extent of the pleura, or is limited to a more or less circumscribed space; hence the pleurisy is termed *costopulmonary*, *diaphragmatic*, *mediastinal*, or *interlobar*, according as the inflammation is limited to the pleura which lines the ribs and the corresponding surface of the lungs, the diaphragm, the mediastinum, or the interlobar portion.

a. *Acute Form.*—**Diagnosis.**—The main characters of this disease are,—acute pain in the side, or in some part of the thorax; cough; difficulty of breathing; fever; more or less dulness on percussion, with egophony, followed by enlargement of the affected side, and abolition of all sound of respiration and voice. Great variety, however, exists in the phenomena, which renders a farther inquiry into the character of the symptoms and signs necessary. Pain is one of the most constant symptoms, and, at one time, it would have been considered idle to suppose, that inflammation of the pleura could exist without it; yet there are cases of what is termed *latent pleurisy*, occurring chiefly in the weak and in those debilitated by disease, in which neither the pain nor general symptoms may excite more than suspicion; and, notwithstanding, the pleura may have been inflamed for a long time; and the inflammation may be accompanied by copious effusion into the cavity of the pleura;—cases which can only be elucidated by auscultation and percussion. Most commonly, the pain is felt in the region of the nipple, on one side or the other, and it is generally of an extremely lancinating character, aggravated by the slightest attempt at inspiration. It may, however, be referred to the axilla, under the sternum or clavicles, or to the region of the scapula, the margins of the false ribs, &c. &c. When the inflammation is seated wholly, or in part, in the pleura costalis, it is increased by pressure on the intercostal spaces; and

wherever seated, it is commonly aggravated by percussion, inspiration, coughing, lying on the affected side. and by the motions of the trunk; so that the patient makes short and repeated inspirations, and dreads the slightest mechanical change induced by the movements referred to. Usually, in acute pleurisy, pain exists from the outset; but it is not always fixed at the first, which may give occasion to its being confounded with pleurodyne, or rheumatism of the parietes of the thorax. At the end of a few days, however,—sooner or later,—it becomes fixed, and constant, and after being for some time excessively severe, it diminishes in violence, becomes obtuse, or may cease entirely before the termination of the disease.

The dyspnœa, which is an accompaniment of the pain, appears to be wholly owing to it; the slightest movement of the ribs, as already remarked, exciting the greatest torture. After the pain on inspiration has abated, or wholly ceased, and the difficulty of breathing continues, this is owing to effusion into the cavity of the pleura, and its degree is, of course, dependent upon the amount of effused fluid. Its character differs, too, somewhat, according to the part of the pleura implicated. If it be the pleura costalis, or both that and the pleura pulmonalis, the breathing is chiefly *diaphragmatic* or *abdominal*; if, on the other hand, it be the pleura investing the diaphragm, the diaphragm is kept as free as possible from motion, and the respiration is performed almost wholly by the ribs, or is *costal*. The pain, too, is usually referred to the margin of the ribs, and causes unusual distress and dyspnœa. The cough is a very uncertain symptom, being, at times, extremely distressing; at others, entirely wanting. It is commonly short and dry, and never takes place in fits or paroxysms.

The decubitus or position of the patient in bed, on the affected side, was mentioned as occasioning an augmentation of the pain; hence, it has been looked to as affording information in regard to the disease. Not much reliance can, however, be placed upon it, either where the pleurisy is dry, or accompanied by effusion. In the great majority of cases, indeed, the position is on the back. The rule generally is, that, in the first stage, the position is on the healthy side; but in after periods, when effusion has taken place, it will—for obvious reasons—be on the diseased side. But the exceptions are numerous. After the pain, for example, has ceased, and copious effusion has occurred, the decubitus is often on the healthy side. Such are the *local* symptoms, that usually accompany and indicate inflammation of the pleura. The *general* symptoms consist of fever, which is usually present, and, at times, to a great degree; the pulse being hard and frequent; the skin hot and dry; and the blood, when drawn, generally exhibiting so markedly the inflammatory crust or buff, that this has been termed *crusta pleuritica*. This is seldom wanting. In 35 cases, observed by Hasse, it was absent 9 times; in 11 cases of pneumonia, 3 times; and in 5 cases of bronchitis, twice. In two cases of pleuritis, in its early stage, before any effusion had occurred, MM. Andral and Gavarret found the ratio of fibrin increased to 5·8 and 5·9 per 1000. In 8 cases of not advanced pleurisy, but in which there was effusion, it varied from 4 to 6; and in 4 cases of pleuritic effusion of some duration, and no fever, it averaged about 4. The increase of the fibrin never appears to be so de-

cided as in pneumonia, bronchitis, and acute rheumatism. In 5 cases of uncomplicated and acute pleurisy, observed by MM. Becquerel and Rodier, the mean proportion of fibrin was 6·1; of corpuscles, 120·4, of albumen, 65·4. The blood corpuscles and albumen were considerably diminished, whilst the fibrin was increased.

The urine is much the same as in pneumonia. It exhibits, especially at the height of the inflammation, all the signs of the urine of inflammation, and at times contains albumen.

These symptoms, taken collectively, would seem to indicate with unerring certainty the existence of acute pleuritis. They are not all, however, well developed in every case, and, as already remarked, they may be so nearly wanting as scarcely to excite a suspicion as to the existence of the disease. In such cases, we have a valuable resource in the physical signs. These, in the majority of cases, leave but little doubt as to the existence of pleurisy, and they are highly satisfactory in determining the effusion of fluid, which is its accompaniment. When the pleura is merely in a state of active hyperæmia, percussion may afford no positive evidence; but when this state has continued for a time, more or less thickening or density is produced in the parts affected, which is indicated by dulness on percussion, more or less considerable, according to their density. The presence of effusion, however slight, is indicated by dulness on percussing the side in which it is. The fluid naturally assembles at the lowest part of the chest, so that if the patient be erect, it descends behind the pillars of the diaphragm, near the spine; and it must be borne in mind, that on account of the restricted dimensions of the cavity of the pleura, in this region, a very small quantity of fluid may rise to a considerable height. At the commencement, therefore, the dulness on percussion will be at the lower part of the chest, whence it is observed higher and higher, as the effusion proceeds, until, ultimately, it may be evidenced over the whole of the affected side, below the fossa supraspinosa, and the clavicles. The fact of the dulness supervening much more rapidly than in ordinary pneumonia, and of its being unaccompanied or unpreceded by the crepitant rhonchus, generally points out pleuritic effusion.

Prior to the occurrence of adhesions between the pleura pulmonalis and the pleura costalis, the lung floats, as it were, on the fluid; and the sound, on percussion, is varied according to the position of the patient. When erect, the dulness is at the inferior part of the chest—the clearness above: if the patient turns on his face, the postero-inferior portion of the chest may give a clear sound; and when he changes his position from side to side, similar phenomena are at times observable. These signs are, however, frequently absent, and, probably, in many cases, owing to agglutination of the pleuræ, which prevents the fluid from changing place. In cases of effusion into both sides of the chest, or of *double pleurisy*, the dulness is, of course, perceptible on both sides.

The signs afforded by auscultation are more varied and more precise than those from percussion. When the inflammation is attended with very severe pain, as is generally the case, the patient restrains, as much as possible, the motions of the affected side; the air, conse-

quently, enters the corresponding lung in less quantity, and the respiratory murmur becomes less audible than on the unaffected side. This has been noticed as an early sign of pleurisy, but it must be equivocal —being dependent upon the presence of pain, which does not always exist, and which, indeed, may exist independently of inflammation of the pleura. Early in the disease, a rubbing, creaking, or friction sound is heard, which may indicate, that the secretion from the pleura has been arrested by the inflammation; or, what is more general, it indicates, that plastic lymph has been thrown out, the consequence of which is, the friction—*frottement*—which, however, may be so slight as scarcely to merit the name of *frôlement* or *slight grazing touch*, but, at other times, is so loud as to resemble the *leather creak*, or *bruit de cuir neuf*, of the French. These signs, when combined with the general symptoms, are valuable in the diagnosis, but they are not of long duration, and, therefore, may not be heard. Friction sounds,—as already remarked—occur likewise, in interlobular emphysema, and as this pathological condition does not speedily change, they persist longer. Recent researches, as remarked by Dr. Williams, would seem to show, that, as in the case of peritonitis, the sounds are not often produced in pleurisy, unless the lung is at the same time pressed against the chest by a tumour or by effusion, or is partially distended by emphysema or by tuberculous or other deposits. When the pleura costalis is raised in this manner, it is readily comprehensible how the friction sounds may be induced, as well as in cases of what are termed "dry pleurisy," or such as are accompanied only by the effusion of lymph. They are generally most audible in the central parts of the chest, owing to the motion of the pleuræ upon each other being most marked in that situation; and, in order to be heard, the patient should be on the abdomen.

When effusion of any kind occurs to a great amount into the cavity of the pleura, the extent of the respiratory movements must be diminished in a direct ratio with the quantity of fluid effused. The sound of respiration will, likewise, be diminished in the affected side, whilst, in the other, it is more extensive than in the natural state. If the effusion is very considerable, the respiratory murmur can no longer be heard; at times, at the lower and posterior part; and, at others, over the whole of the chest. The lung, compressed by the fluid, is forced, in the majority of cases, on the vertebral column; and the respiratory murmur—if heard at all in any part of the thorax—is so very indistinctly. Often, in such cases, the respiratory or vesicular murmur is replaced by bronchial or tubal respiration, in regard to the frequency of which in pleurisy difference of sentiment exists. M. Grisolle found it in nearly one half of fifty observed cases; but the general impression of Dr. J. B. Jackson, of Boston, is, that it is still more common. As to the character of bronchial respiration in pleurisy, as distinguished from that of pneumonia, he differs from the descriptions of others. MM. Barth and Roger say, that in pneumonia the bronchial respiration is strong, clear and tubular, as if the air-tubes were metallic; "in pleurisy it is oftener indistinct, feeble, not tubular; sometimes harsh or sharp and bleating, as if the air traversed flattened tubes." The harsh bleat-

ing character is what Dr. Jackson has almost always observed; and he regards the term egophonic used by Dr. James Jackson of Boston, in the hospital records, to be strongly expressive of the same idea. This bleating tone, not indistinct and feeble, but strongly pronounced, he deems highly characteristic of the bronchial respiration of pleurisy, and not an occasional occurrence. Contrary to MM. Barth and Roger, Dr. Jackson has found this sign continue longer than in pneumonia: it generally lasts through all its stages: "in a patient now in the hospital, and who has been there for some weeks, with undoubted chronic pleurisy of eight weeks' duration, the bronchial respiration is intensely marked over the whole left side of the chest, front and back." It would appear, too, from Dr. Jackson's observations, that marked bronchial respiration has existed where dissection exhibited large effusion; where the lungs were greatly compressed, and there were no adhesions.

When effusion exists, and the patient is made to talk, the physician's hand being at the same time applied to the parietes corresponding to the seat of the effusion, very slight, or no vibrations may be felt; whereas these vibrations are very manifest in health. In this way, by placing a hand under each scapula, a pleuritic effusion may be detected by the absence of vibration over the dull portion. Dr. Stokes regards it as of far greater value than the egophony to be described presently. It is a physical sign, however, which does not exist in many cases of females, and boys previous to the change of voice; —the vocal vibrations in them, although audible, being not sufficiently powerful to be felt by the hand. The layer of liquid between the lung and the chest modifies or destroys the vibrations, a very different effect from that produced by solidification of the lung, by which the resonance of the voice is powerfully augmented.

When a moderate effusion has taken place, so that there is dulness on percussion, and diminution of the respiratory murmur in the lower part of the chest, a singular resonance of the voice is observed posteriorly, which appears to be superficial, and separate from the true voice. It is a peculiar tremulous, broken voice, somewhat resembling the voice of the goat, and hence termed *egophony* or *goat's voice*. This peculiarity appears to be a kind of bronchial voice modified by its transmission through a stratum of liquid. This has been considered one of the characteristic signs of pleuritic effusion; but the observation of most persons has shown, that it is not so certain as was at one time supposed; usually, when the effusion becomes considerable, the egophony is no longer heard; but there are cases on record in which the whole of one side of the chest was filled with fluid, and egophony still present, whilst in others, where the effusion was slight, it was absent. Dr. Stokes places but slight value on egophonic sounds in pleurisy. "In many instances," he remarks, "we never find them, and even when present they are extremely inconstant, and, taken alone, have but little value in diagnosis." Between them and those from hepatization of the lung, there is often the closest resemblance. Dr. J. Wolff, indeed, affirms, that they are heard in the second stage of pneumonia, accompanied by the bronchial or tubal respiration; Dr. Stokes, that almost perfect egophony has been heard in the stage of

resolution of a few cases of pneumonia; and M. Renaud, that egophony is only audible in cases in which the inflammation of the pleura is accompanied by inflammation of the lungs. It is rarely heard over the whole extent of the effusion. Most commonly it is perceived between the spine and scapula, at the circumference of the latter, and in a zone, according to M. Grisolle, from 6 to 9 centimeters (in. ·235 to 3·53) wide; or between the scapula and nipple. It disappears when the effusion diminishes, or becomes very considerable; in the latter case, the sound is at the same time completely dull, the resonance of the voice not heard, and at length no natural or morbid sound is audible during the act of respiration, excepting along the spine, where the respiratory is still distinguishable, because—as before remarked—the lung is crowded on this point.

The pectoriloquism of phthisis, and the egophony of pleurisy, are regarded as the least valuable of the physical signs of these diseases; still, the presence of egophony, with dulness on percussion, enfeebled respiratory murmur on the affected side, with absence of the crepitant rhonchus, and of the vibratory vocal fremitus, would be a strong combination of evidences in favour of the existence of pleurisy. The true character of egophony has been described by Dr. Williams as a certain tremulousness of the voice when it is superficial, and an echo-like slenderness when it is deep-seated. At times, the diminution of the pleuritic effusion is indicated by the return of the egophony, (*ægophonia redux.*) It is affirmed, however, by M. Grisolle, that this returning egophony is only observed in cases in which, owing to the disease having pursued an acute course, the lung has not been subjected to a prolonged or too considerable compression. The phenomenon is constantly wanting during the absorption of effusions, which is effected very slowly.

When the accumulation of fluid is to a great extent in one of the pleuræ, it gives rise to an increase of the size of the side, which is evident to the eye, and, if not, is discoverable by mensuration with a graduated tape, or with callipers, similar to those used by many of the French obstetricians for appreciating the distance between the posterior surface of the sacrum and the anterior surface of the pubis, by means of a graduated arc, which is attached to one leg of the callipers, and passes through an eye in the other. The increased size is affirmed, on excellent authority, that of MM. Laënnec and Andral, to be observable early; Laënnec says after two days' duration of the disease; Andral, on the fourth or fifth day. The author's observation would lead him to fix the appearance of this phenomenon at a later period. It has been usually considered, that protrusion of the intercostal spaces is always coexistent. But this, as remarked by Dr. Stokes, may be wanting. Moreover, dilatation of the side may not be present, where even copious effusion exists, owing to the displacement of the diaphragm. The observer, in making these comparisons, must bear in mind, that the right side, in health, is often larger than the left. The average result of the most accurate measurements of the chests of 20 persons not labouring under disease of the lungs gave, according to Dr. Stokes, for the right side, 17·86 inches, and for the

left, 17·23,—or more than half an inch in favour of the right lung. Of these, the most capacious chest measured 22 inches for the right, and 21·50 for the left. In one case only, the left side was larger than the right, and in three, the sides were symmetrical. In the case in which the left side was more developed, the man was left-handed, and the left biceps measured half an inch in circumference more than the right. The following admeasurements of ten males and ten females were taken partly by the author, but chiefly by the late Dr. Moore Robinson, at the time one of the resident physicians to the Philadelphia Hospital. None of the individuals were labouring under disease of the lungs.

MALES.

Ages.	Occupations.	Left side.	Right side.
67	Carrier,	18¼ inches.	18⅜ inches.
25	Shoemaker and Pedlar,	16	16½
56	House Carpenter,	16½	18
49	Do.	18	18¼
41	Carriage Painter,	16¾	17¼
32	Apothecary,	18	17½
32	House Painter,	14⅜	15⅓
30	Labourer,	17	17⅜
30	Do.	17	17
42	Do.	17	17⅜

The average of these observations gives 16·92 inches for the left side, and 17·47 inches for the right; or a difference of about half an inch.

FEMALES.

Ages.	Occupations.	Left.	Right.	Hand most used.
20	Servant maid,	13	13	Uses both alike.
24	House maid,	16¼	16¼	Do.
25	Do.	15	15	Do.
23	Do.	15½	16	Right.
20	Do.	14	15½	Do.
19	Seamstress,	15½	16	Do.
22	House maid,	16	16½	Do.
21	Do.	16½	16	Left.
24	Shoebinder,	13¾	13	Do.
26	House maid,	15½	16½	Right chiefly.

The average gives 15·1 inches for the left side, and 15·2 for the right, or a difference in the female of not more than one-tenth of an inch. In instituting the comparative admeasurement, the tape may be passed horizontally around the chest, under the nipple, and be made to meet at the centre of the lower end of the sternum.

Sooner or later, careful examination may exhibit, that the intercostal spaces do not present the usual depressions on the affected side, and ultimately they appear entirely smooth, so that, in thin persons, the contrast is perceptible on careless inspection. It is important, however, to bear in mind, that an effusion, sufficient to dilate the side and

displace the heart, may exist for weeks without inducing it. Smoothness of the side is not met with in the earlier periods of the disease, and appears to be peculiar to pleurisy in its advanced stages, as it is not observed in emphysema of the lungs, pneumonia, simple hydrothorax, or enlargement of the liver. Hence, it is esteemed one of the most important of the physical signs of advanced pleurisy. In looking for this sign, the patient may be placed obliquely with regard to the light, and it may be more readily seen by regarding the chest from a little distance. The diaphragm, too, may be displaced by the effused fluid, and the displacement may be recognised by examining the upper part of the abdomen, which is found full and resisting. If the fluid be on the right side, the liver is pushed downwards, forwards. and across the abdomen; if on the left, the spleen may be displaced; but the latter displacement is more rare. When the liver is displaced, a distinct sulcus or furrow may be often felt immediately below the ribs and above the upper boundary of the tumour, resulting from the space left by the touching of two convex bodies—the upper portion of the liver and the protruded diaphragm. On the absorption of the fluid the liver ascends, and the sulcus disappears. This physical sign was first observed by Dr. Stokes, in 1832; farther observation has, however, shown, that the disappearance of the sulcus does not necessarily imply the ascent of the liver to its natural position; for the liver may yield to the pressure of the diaphragm, and become deeply indented, or concave on its upper surface; so that the disappearance of the sulcus is only favourable when accompanied by the ascent of the hepatic tumour. More than one case of latent pleurisy has been noticed, in which the tumour, formed by the liver, was long supposed to be the chief disease—the patient not complaining at all of the chest.

The displacement of the liver and heart, from pleuritic effusion, was scarcely noticed by Laënnec. It is chiefly to Drs. Stokes and Townsend, of Dublin, that we are indebted for our information regarding it. The displacement of the heart is an important sign, which exists from the earliest periods, long before any protrusion of the intercostals or diaphragm. When effusion has occurred into the left pleura, the pulsations of the heart may be observed most distinctly immediately under, or to the right of the sternum, instead of in its usual position; and, again, if the effusion have taken place into the right pleura, the heart is pushed towards the left axilla. In a case of hydropneumothorax of the right side, Dr. Townsend saw and felt the heart pulsating between the fourth and fifth ribs, near the left axilla, whence it gradually returned to its proper position as the compression was removed by drawing off the fluid from the opposite side; and a similar case occurred to the author very recently. In this, the impediment to the circulation was so great, that the individual was in a state of cyanosis. The relief afforded by withdrawing the fluid was signal; but it was only temporary;—the empyema being accompanied by tuberculosis. When the fluid accumulates in either pleura, to the extent of producing displacement of organs contained in the other, the mediastinum, which lies immediately behind the sternum, must be pressed from its situation, so that fluid is immediately behind it; hence

it renders a dull instead of a clear sound, when the sternum is percussed. Sometimes this dulness extends half an inch or an inch beyond it. It need scarcely be added, that all these displacements may be produced by pneumothorax, or by an accumulation of air in the cavity of the pleura; but the tympanitic sound on percussion, in the latter case, will distinguish it.

Such are the main general symptoms and physical signs of acute pleurisy. If the disease be unaccompanied by effusion, the morbid phenomena generally disappear in a few days, and health is restored; but if effusion have occurred, the restoration to health, if it take place at all, may be at an uncertain period. The acute condition may pass away, or it may terminate in the chronic. When effusion has been to such an extent as to give rise to the evidences already described, the absorption of the fluid is indicated by changes in the respiration, which—if it have been absent—may be heard feebly, and gradually augmenting in the upper portions of the affected side, both anteriorly and posteriorly: the signs, too, of the different displacements gradually disappear, but the thorax may remain more or less contracted, owing to causes described under Chronic Pleurisy.

It is proper to remark, that the different phenomena furnished by percussion and auscultation may become more obscure or more evident, disappear or change place, when the position of the patient is varied, and in this manner the fluid is made to shift its seat. This, however, does not happen as often as has been supposed, in consequence of adhesions, which rapidly become organized and by circumscribing the adhesion prevent the displacement of the fluid.

As in other cases of serious inflammation of internal organs, death may take place in a few days; yet this does not happen frequently. In the bills of mortality of New York, for 1842, 21 persons are said to have died of pleurisy; and of 26 cases that occurred in one year in the Philadelphia Hospital, only one died,—facts which show, that it is not a fatal affection, under appropriate management. M. Grisolle affirms, that he has seen but one fatal case of uncomplicated pleurisy. Double pleurisy is of course more serious. Not unfrequently, tubercles form in the inflamed pleura. Where this is the case, the patient dies of marasmus and hectic fever, and the case is probably reported as one of consumption.

Causes.—The general causes of pleurisy are like those of pneumonia, and other internal inflammations. In addition, however, it may be produced by external violence, as by wounds and contusions of the chest, fracture of the ribs, &c. Organic diseases of the lung, likewise, occasion it. Thus, it has been already remarked, that pneumonia is usually accompanied by some degree of inflammation of the pleura,—hence the term *pleuropneumonia*, applied to pneumonia by many, from the supposed constant association of the inflammations;—and also that the pleura is almost always involved, sooner or later, in tubercular phthisis. The latent character of pleurisy, in many cases, has likewise been referred to. Persons, indeed, often pass through life without being aware of the existence of adhesions between the pleura costalis and the pleura pulmonalis, which dissection alone reveals. The

disease occurs at all ages, and is one of intra-uterine existence. Many cases are on record, in which manifest signs of pleuritis and of its concomitant—sero-purulent or purulent effusion—have been observed on the dissection of the still-born, or of those who have died almost immediately after birth. It is probable, too, that pleurisy is more common among young infants, than is generally believed. In the annual report of the interments of the city of New York, for 1839, 21 deaths from pleurisy are recorded, whereof 6 were under the age of 5 years, and 3 of these under the age of 1.

Pathological Characters.—The appearances, observed on the dissection of those who have died of acute pleurisy, may be partly anticipated from the history of the symptoms and signs already given. Simple inflammation of the pleura does not differ, in its morbid appearances, from inflammation of the peritoneum. If death have occurred early, we meet with more or less redness and injection of the sub-serous cellular tissue; the serous coat, in slight cases, being dry perhaps, but not seeming to be much, if at all, affected otherwise, and preserving its transparency; but in more severe cases, it exhibits great vascularity, either in points, streaks or patches, or a uniform redness is observed over a greater or less extent of surface; but this last appearance is rare. The membrane is not often thickened, softened, or ulcerated. Very early, however, if the disease persist, various alterations take place in the secretions from the membrane, which are modified both in quantity and quality. The quantity of fluid may vary from an ounce to several quarts, so as, indeed, to fill the whole of one side of the pleura, compressing the lung, pushing the diaphragm downwards, and with it the liver and the spleen; enlarging the intercostal spaces, and causing them to project outwards, and displacing the mediastinum, heart, &c., in the manner already described. Its character varies greatly. Sometimes it is colourless; at others, yellow, limpid and transparent; sometimes containing albuminous flakes swimming in it, but, at others, dissolved in the fluid and disturbing its transparency. Frequently, the fluid is more or less coloured and turbid, and occasionally very thick, and of a dirty or muddy appearance. In other cases, pus is found in the pleura, or a peculiar fluid resembling half melted meat jelly, or even blood: in the last case, it constitutes the *hemorrhagic pleurisy* of Laënnec, *Hæmathorax* or *Hæmatothorax;* Ger. *Blutbrust.* The plastic lymph, which is the product of pleuritis, and is sometimes thrown out without the effusion of fluid, forms the bond of union in the cases of adhesion, which are so frequently met with on dissection, that they have been properly regarded as the most common of all morbid appearances, and are found to a greater or less extent in all the bodies, that are subjected to inspection. Strange to say, these adhesions were at one time considered to be produced by laughing! The plastic lymph appears to be capable of self-organization, like the fluid which is thrown out in ulcers, and the materials of which the new being is formed after a fecundating copulation; and sooner or later the membranes become firmly united. The albuminous exudation assumes different forms. At times, miliary granulations are alone perceptible, separated from

each other; at others, large concretions cover the pleura and increase its thickness, leaving it at times smooth and polished; at others, rugous; and at others, with nipple-like projections. These "concretions" frequently extend like bands, (*brides*) from one pleura to the other, making bonds of union, which, by intercrossing through the fluid, form cells, of greater or less number and regularity of shape. When these adhesions are recent, they are soft, readily lacerable, and have an albuminous appearance; but sooner or later they become transformed into a cellular tissue, which unites the pleuræ, in the mode so often seen in those who exhibit, on dissection, the signs of a former pleurisy. The adhesions are generally colourless, but, at times, they acquire a yellow, gray or reddish hue from the fluid with which they are in contact. At times, they pass to the fibrous, cartilaginous, and even osseous state. Often, too, tubercles are found in them, which, at times, become developed with great rapidity. These appearances may be found in one or both pleuræ, according as the pleurisy is *single* or *double*, or they may be confined to a portion of one pleura. Both sacks are rarely, however, inflamed simultaneously. Of 35 fatal cases, which fell under the care of M. Hasse, only 9 were double pleurisies, and in 5 of the 9 one sac was implicated only in a minor degree. Both sides, he thinks, appear to be almost equally liable to be affected; but pleurisy of the left is both more likely to prove fatal in the acute stage, and more apt to pass into the chronic. In his 35 cases, however, the left side was the seat of the disease in 16; the right in 10; and he refers to 56 cases, observed by Mohr, in which the left side was affected 37 times; the right 19; showing, as far as they go, that the left pleura is much more liable to be inflamed.

The condition of the lung is more or less modified, according to the extent and nature of the effusion. If the quantity of fluid be very great, the lung may be so much compressed as to form a mere thin strip, occupying a very short space along the spine. In an interesting case, which fell under the author's care, and which he has described, in its other relations elsewhere, (see Dislocation of the Spleen), the right lung was found reduced to scarcely more than a bulb. The inflammation had passed to the chronic state, and the right pleura was completely filled with fluid. In another case of double chronic pleurisy, both lungs were reduced to mere knobs by the pressure of the fluid, and the consequent condensation and atrophy. In cases like these, for some days before dissolution, hæmatosis is executed most imperfectly, and—it must be presumed—by the bronchial tubes themselves. The lung, that is thus compressed, does not crepitate, but is dense, and sinks to the bottom of the water. These appearances are, however, more marked in chronic pleurisy than in the acute.

Treatment.—The management of pleuritis is much the same as that of pneumonitis. Bloodletting is generally demanded, and it must be repeated according to the severity of the disease, and the habit of the patient. When the system has been lowered by two or three bleedings, it is better to trust to local bloodletting, especially by cups, which exert both a depletive and revellent agency; after which a

large emollient poultice may be applied over the pained part. The more powerful revellents, as blisters, are more efficacious after blood-letting. One of the most valuable is mercury pushed so as to affect the mouth. It is esteemed, by some, to occupy the important place as a remedy for inflammation of a serous membrane, which the tartrate of antimony and potassa—it is conceived by many—does for that of the lung itself. The ptyalism—it has been advised by Dr. Marshall Hall—should be kept up until the effusion is absorbed.

In Germany, according to Sir George Lefevre, it is usual in pleuritic affections to combine muriate of ammonia with tartrate of antimony and potassa, as in the following formula:—

R.—Ammon. muriat. ℥j.
Antim. et potass. tart. gr. ij.
Decoct. glycyrrhiz. f ℥vij.
Syrup. althææ. f ℥j.—M.

A tablespoonful of this is given every two hours, and continued in spite of the nausea and occasional vomiting, which the first few doses seldom fail to produce.

The cough should be alleviated by all the means that are recommended under Bronchitis; and, if necessary, full doses of opiates should be given with this view.

After the violent symptoms have passed away, and the effusion alone remains—which it does, at times, for a long period—blisters may be applied so as to induce an intermittent counter-irritation, or the seton may be used,—but the former are to be preferred; or, the ointment of tartarized antimony may be applied. Diuretics may likewise be administered, as in other cases of accumulation of the fluid of serous membranes. Cathartics may also be given, but care must be taken not to reduce the powers of the system too low.

In the early period, the diet should be as dry as possible, and the thirst may be allayed by small pieces of ice taken into the mouth; and afterwards the diet may be farinaceous, with or without milk.

b. *Chronic form.*—Chronic pleurisy occurs generally in feeble individuals, and may possess its chronic form from the beginning, or, it may be the termination of acute pleurisy. Some, indeed, as Laënnec, admit three kinds of chronic pleurisy; 1st, That which is chronic from the beginning. 2dly, That which was acute, and has become chronic; and 3dly, That which is complicated with certain organic productions on the surface of the pleura. Others, as Dr. Mackintosh, have described,—first, the chronic pleurisy, which terminates in empyema; and afterwards that which ends in permanent contraction of the chest.

Diagnosis.—The symptoms and signs of chronic pleurisy are chiefly those that denote copious effusion into the pleura of the affected side, and they are the same if the pleurisy be any of the kinds described by Laënnec;—generally difficulty of breathing, at times amounting to orthopnœa; dry, tickling cough; hectic fever; enlargement of the affected side of the chest, and of the intercostal spaces; impracticability of lying on the sound side; and, at times, fluctuation; percussion dull; respiration inaudible, except in the region of the vertebral column, and puerile on the opposite side, unless the case is one of "double pleurisy," which is not common. These—it will be observed

—are essentially the symptoms and signs of acute pleurisy terminating in effusion; and it has been properly remarked by Dr. C. J. B. Williams, that there is less reason for distinguishing formally between acute and chronic inflammation of the pleura, because the transition of one into the other is, in reality, undefined, and the symptoms of the recent disease have sometimes so little of an acute character, whilst one of a long duration occasionally manifests such an intensity of irritation, that the terms "acute" and "chronic" are less applicable to pleuritic affections than to inflammation of most other organs.

Pathological Characters.—To the effusion of fluid, whether supervening on an acute or chronic attack, the name *empyema* has been given, which literally means an effusion of pus, (from ἐν, "in," and πυον, "pus;") yet the term has been extended, conventionally, to the effusion of other fluids—bloody, or serous—into the cavity of the chest. Empyema, in the sense of effusion of pus into the cavity of the pleura—has also received various synonymes—as *Empyema verum*, *Pyothorax*, *Pleurorrhœa purulenta*, *Diapyema*, *Ecpyema*, *Ecpyesis*, *Empyesis pectoris*, *Pyosis pectoris*, *Hydrothorax purulentus*, *Dyspnœa pyothoracica*; Fr. *Empyème*, *Pyopleurite* of Piorry; Ger. *Empyem*, *Eiterbrust*, *Brustgeschwür*. The effused fluid, in chronic pleurisy, may be absorbed in process of time, and the chest may return to its natural position, without any resulting contraction; and this is, at times, effected so rapidly, that a dilated side of the thorax has been known to lose as much as an inch and a half in eight days. Commonly, however,—and this is usually the most favourable termination,—the fluid is more gradually absorbed, and the affected side, from being preternaturally distended, becomes greatly contracted. This change has been regarded as not simply the result of the parietes passively following the absorbed fluid, but attributable to the new structures formed undergoing contraction. It is easy, however, to comprehend, that if the lung has become so far compressed and condensed, by the lymph and effused fluid, as to be incapable of expansion when the fluid is absorbed, flatness and contraction of the chest would be a natural result of atmospheric pressure, if from no other cause. The difference between the two sides is found to be great; the intercostal spaces of the affected side are contracted; the shoulder is lower; the scapula approaches the vertebral column, and the muscles of inspiration, especially the pectoralis major, lose their volume. In some cases, the lung of the affected side gradually resumes a part of its functions; the respiratory murmur becomes audible, but imperfectly so; and although the deformity of the chest has been manifest, the state of the individual has permitted active exercise of the lung, and public exertion of the voice. Such—it is presumable—was the fact with one of the individuals, whose chest was examined by the author, and the admeasurements of which are given elsewhere, (p. 434). The difference between the two sides was an inch and a half, and the deformity, of course, obvious on the slightest inspection; the respiratory sounds were distinct on the right side, but by no means so on the left; yet, the individual was an active labourer, and had no recollection whatever of having suffered from pleuritis. Such cases as these strikingly show

the inadequacy of physical signs, taken alone, to establish the diagnosis in all cases.

Instances have occurred, in which, after the absorption of an effusion on the right side, the heart was drawn over to that side, so that its pulsations were felt to the right and not to the left of the sternum: at times, too, after the removal of pleuritic effusion on the left side, the heart is drawn upwards to the left.

It need scarcely be said, that although in some cases after the cure by contraction of the chest, the persons preserve excellent health, and exhibit no signs of pulmonary disorder, this is not to be expected. Usually, indeed, there is more or less liability to affections of the respiratory organs, and a cachectic condition, which ends, at times, in tuberculosis. Frequently, indeed, chronic pleurisy coexists with tubercles in the lung; and often, also, in the false membranes of the pleura. In other cases of chronic pleurisy, the termination by contraction of the chest, does not ensue; the fluid continues accumulated, and it becomes necessary to have recourse to some direct means for its removal.

Occasionally, the lung has been found so much atrophied as to be scarcely more than from a third to half an inch in thickness. It is often covered with very thick false membranes, which led many of the older physicians to suppose, that it had been destroyed by suppuration. The contraction of the chest is almost always permanent. M. Chomel has, however, related a singular case, which demonstrates, that when the chest has been considerably constricted, in consequence of chronic pleurisy, it may, after several years, resume its pristine dimensions. It would seem, too, that in all the cases of contraction of one side of the chest, the other side becomes developed under the increased duty, which the corresponding lung has to execute. When the atrophied lung is examined, it is found adherent to the ribs by means of a very resisting fibro-cartilaginous tissue; whilst the pulmonary tissue is flabby, of a reddish colour, and similar to muscular flesh.

Occasionally, the effused fluid makes its way into the bronchia, and is discharged, and in rare cases, it passes through the parietes of the thorax, in consequence of an abscess communicating with them.

When the pleurisy terminates in a general adhesion between the pleura pulmonalis and pleura costalis any return of the disease is impossible, as there is no longer any pleural cavity.

Dr. Robert L. MacDonnell—formerly of Dublin, now of Montreal, —has related several cases, wherein one or more tumours appeared on the surface of the chest, which, after pulsating for some time, became red, tense, and shining, and eventually burst, giving exit to large quantities of pus. To empyema attended with these pulsating tumours he gave the name of "*Pulsating Empyema of necessity.*" They exhibit some features common to empyema and thoracic aneurism, and to encephaloid disease of the lung. From thoracic aneurism, this form of empyema may be diagnosticated by the history of the case; the dulness extending over the whole side, whilst the pulsation is felt only in the external tumour; by the absence of the thrill and of the *bruit de soufflet*, and by the extent and character of the fluctuation. From encephaloid

disease of the lungs and mediastinum, it may be discriminated by "the absence of the expectoration, resembling black currant jelly," by the absence of persistent bronchitis, of a varicose condition of the veins, and œdema of the side affected. In cancer of the lung, too, the situation in which the external tumours form is not invariably confined to the thorax. Dr. MacDonnell infers farther, as the result of his inquiries; *First*, that copious purulent expectoration in empyema is not always indicative of cavities in the lung; but, on the contrary, is of frequent occurrence in the disease, and "seems to be the result of an effort of nature to get rid of the purulent collection at the nearest and readiest outlet." *Secondly*, that this symptom, when it results from the above cause, is not attended with the usual symptoms of either abscess of the lungs, or inflammation of the bronchial mucous membrane. *Thirdly.* That a true bronchitis of the sound lung frequently complicates empyema. *Fourthly.* That, still more frequently, the sound lung becomes congested, and presents some of the ordinary signs of bronchitis and pneumonia, from both of which, however, it may be distinguished by careful examination. *Fifthly.* That in addition to depression of the liver from mechanical causes, that organ is enlarged from engorgement with blood in empyema. *Sixthly.* That this enlargement is not confined to empyema of the right side, but occurs also when the disease is seated in the left cavity of the chest. Dr. MacDonnell is of opinion, that the enlargement of the liver is owing to the condition of the lung interfering with the elimination of carbon, so that an additional duty is thrown upon the liver; hence an increased afflux of blood takes place to it, whereby its structure becomes engorged, softer in consistence, and darker in colour; and he considers the condition as constituting an additional feature in the diagnosis and pathology of empyema; and adds, that its disappearance is one of the first signs, that indicate the removal of the effusion, and the return of the compressed lung to the performance of its functions.

It has been occasionally noticed, that effusions of purulent fluid into the cavity of the thorax have, under special circumstances, been discharged by the kidneys. M. Schönlein—it is affirmed—has witnessed many such cases, and M. Simon asserts, that he has had several opportunities in the clinical wards of the hospital at Berlin of seeing cases of pleurisy with empyema, in which, after a proper course of treatment, turbid urine was discharged for some days. This urine contained albumen, and deposited a sediment, which, under the microscope, and in its general physical relations, resembled pus, or, in one case, mucus mixed with pus. The urine, which after some time became clear above the sediment, was of a dark colour, only slightly acid, and soon became alkaline. The symptoms of empyema gradually disappeared in proportion as the urine continued to form purulent sediments.

Treatment.—Where the symptoms and physical signs, described above, indicate that the state of chronic inflammation of the pleura exists, and there is reason to believe that it has been of some standing, the patient should be confined to the horizontal posture—in bed, for example; and there remain, perhaps, for weeks. The diet should

consist of milk and the farinacea; and leeches, or cups, with the scarificator, be applied every two or three days, for the first week or ten days,—for a longer or shorter period, as the nature of the case may suggest. About the expiration of this time, revellents, as small blisters, or the tartarized antimony ointment, may be applied to the chest, so as to induce an intermittent irritation; and mercurials may be administered so as to affect the mouth slightly. These may be given from the first, and should their effects not be perceptible when the blisters are begun with, the blistered surfaces may be dressed with mercurial ointment. Under the employment of these means, the physical signs, in the course of two or three weeks, may be found to indicate a diminution in the extent of dulness; and if the heart have been displaced, its return to, or towards, its proper situation. If the febrile symptoms have passed away, after this treatment has been pursued for a time, the diet may be made somewhat more nutritious, by adding light boiled eggs, and perhaps a small quantity of any of the lighter meats,—care being taken not to induce undue excitation. By this mercurial course, supporting, at the same time, the powers of the system, Dr. Hope succeeded in curing thirty-five cases in succession.

When the inflammatory action has been removed, the absorption of the fluid may be promoted by any of the diuretics, that are employed in cases of hydrothorax, or of other hydropic accumulations:—it is well, however, to notice whether albuminuria be coexistent, as in such case stimulating diuretics must be used with caution. Cathartics may be substituted, which may be repeated twice a week. Iodine has in this stage been highly extolled—employed both internally and externally. Dr. Stokes advises, that a pint of Lugol's solution or mineral water should be taken during the day,[a] and from a quarter, to half of an ounce of the compound iodine ointment[b] be rubbed daily over the side. By this plan he cured twenty cases.

[a] ℞.—Iodin. gr. ½.
Sodii chlorid. gr. xii.
Aquæ destillat. Oj.
Lugol makes the solution of three strengths, gr. ½, gr. ¾, and gr. j. of iodine to the pint of water.

[b] ℞.—Iodin. ℥ss.
Potassii iodid. ℥j.
Alcohol. f℥ij.
Adipis ℥ij.—M.

By others, the internal use of the iodide of potassium is preferred, (gr. ij. vel. iij., three or four times a day,) and in more asthenic cases the iodide of iron. These remedies may be associated with blisters, and their effect in promoting absorption has been, sometimes, singularly rapid. The iodine generally acts as a diuretic, and must be continued until all liquid is presumed to be removed from the pleura. The iodide or red iodide of mercury would be a good remedy in such cases; combining, as it does, the powers of a mercurial with those of iodine.

Two cases have been related in which electro-puncture was employed. In one a very marked and rapid absorption of the fluid took place after two or three applications of the remedy, the function of secretion being modified under its excitant action.

When the patient is free from fever, and *à fortiori* when convalescent, change of air, with gentle travelling exercise, is advisable; a

voyage to the West Indies has, indeed, been esteemed *the* remedy *par excellence*, as in so many other diseases of the chest. Should deformity supervene, it may improve somewhat by time; but as the morbid change in the lung is generally permanent, not much improvement can be expected. Carefully regulated gymnastic exercises, and, "perhaps, electricity," have been suggested to restore the tone of the intercostal muscles, but, for the reasons already given, it is not easy to see what advantage could accrue from them. Were they, in any degree, to expand the chest, the morbid condition of the lung would still remain.

By many, all remedies in empyema have been esteemed inoperative, but many cases unquestionably recover with the contraction of the kind mentioned. Twenty cases of complete and permanent recovery from empyema by absorption have been recorded by one author —Dr. Stokes—so that, as he properly remarks, the probability of a cure, and the efficacy of remedies, is much greater than has been supposed.

When all remedies have failed, and the patient is threatened with suffocation, or suffers much distress from the mechanical pressure of the fluid on important organs, the operation of paracentesis or puncture of the thorax is the last resource; but the results of many cases, which show, that absorption may ultimately be effected even in unpromising cases, would indicate, that it may not have been always necessary where it has been performed. Different instruments have been used for the evacuation of the fluid. Dr. Prichard, of Bristol, England, employs a needle with a larger groove than in the common instrument. In this mode, he says, he is able to evacuate any fluid with perfect ease and safety, and with the advantage, that the pain attendant upon the operation is so trifling, that the patient will at times call for a repetition of it, after having experienced the relief, which follows its use. Dr. Babington has proposed an instrument, which he considers to be superior in some instances to the grooved needle, through which fluid at times flows with difficulty. It consists of a very small trocar and canula, which, together, are not thicker than an ordinary grooved needle, and a probe, which will pass through the canula. The grooved needle may mislead the physician in his diagnosis of empyema. By separating the serum from the small concretions of albumen, it may occasion an empyema to be considered a simple serous effusion, whilst the small canula would, Dr. G. Bird considers, be more likely to exhibit the true nature of the affection. Dr. Bird, in presenting the instrument before the Westminster Medical Society, related a case in which there was every physical sign that could lead to the conclusion, that there was effusion into one side of the thorax. The small trocar was introduced, but no fluid escaped, and on passing the probe through the canula the lung could be distinctly felt. No ill effect followed the trial, and the case proved to be one of rapid softening of the lung after tubercular deposit. Dr. Babington had employed the instrument to diagnosticate an obscure tumour, which filled the right hypochondrium and iliac regions. A thick, dirty fluid escaped, and the probe could be passed to any extent without meeting with resistance, showing that

the tumour contained a viscid fluid. No bad effects followed the exploration, and when the patient died, the tumour was found to be an enormously distended gall-bladder.

The operation is not demanded solely in chronic pleuritis. If, in the acute form, the effusion takes place so quickly, and copiously, as to endanger the very existence of the patient, by compressing the lungs, and other important organs within the chest, it may be necessary. When the operation is performed in the latter case, the fluid is usually serous, with more or less plastic lymph, and it commonly deposits a further clot of gelatinous fibrin after it has been drawn from the chest; whilst in chronic pleurisies, it presents the appearances described under the head of "pathological characters" of acute pleurisy, and, occasionally, of purulent matter, which is not readily absorbed. These are cases of true empyema, in the sense in which it is usually employed, and in which paracentesis is considered the more necessary; yet it does not appear, that the operation has been equally successful where the fluid has been purulent as where it has not.

Although the operation may be indicated in cases of chronic pleuritis, there are many obstacles to its success. If the lung be bound down, or so condensed that it is incapable of expansion, the removal of pus, or other fluid, merely gives occasion to the entrance of air, or, in other words, the pyothorax is converted into pneumothorax. Not unfrequently, too, tuberculosis has occurred, and the operation has been performed, when the patient was labouring under phthisis also. In other cases, when fluctuation has been evident—a circumstance which commonly proves, that air is in the chest, and this, in the large mass of cases, owing to a fistulous communication between a bronchium and the cavity of the pleura; and, as the existence of fistula implies disease, and, almost always, tubercular disease of the lung—success cannot be expected from the operation. It has, however, succeeded, notwithstanding these impediments. Should any doubt exist as to the presence of fluid, a grooved or exploring needle, as advised by Dr. Davies, may be passed into the chest, by which not only the presence, but the character of the effused fluid may be detected. Where there is no pointing of the fluid, the middle portions of the chest are considered the most eligible places for the operation—between the third and the seventh rib, in the opinion of Dr. C. J. B. Williams: the fifth intercostal space is recommended by Drs. Townsend and Stokes. Lower down, there is danger, at times, of wounding the diaphragm; and this has actually happened. In a case in which the author directed the operation of paracentesis, the operator, in accordance with the recommendation of Dr. Fergusson, selected the space above the seventh rib, a little in front of the angle for the place of puncture, but no fluid escaped. On repeating the operation immediately above the fifth rib, half way between the spine and the sternum, he was entirely successful.

In a late number of the Guy's Hospital Reports, Dr. Hughes and Mr. Cock have published the results of their experience in regard to paracentesis thoracis. They consider the best spot for the puncture to be below the angle of the scapula, between either the seventh and eighth

or the eighth and ninth ribs, and at a point distant from one to three inches from the angle of the bone. In this situation there is least danger of wounding the diaphragm, and the greatest probability of procuring a free discharge of the effusion. In many cases, however, it is desirable to make an exploratory attempt by the instruments already mentioned, and especially by that of Dr. Babington. Having determined upon the propriety of farther proceedings, the trocar and canula are to be introduced in the same spot. Mr. Cock uses a circular instrument, which is about one-twelfth of an inch in diameter, and about two inches in length, exclusive of the handle. This is less than the usual size, but it is more easily introduced, gives less pain, ensures a slow and gradual evacuation of the fluid, and enables the operator to avoid the admission of air. The patient is made to sit across the bed, so that his body may be readily lowered and supported over its edge. The introduction of the trocar will be much facilitated by making a small puncture in the skin with a narrow-bladed lancet. When the trocar is first withdrawn, the fluid will issue in a steady and equable stream; but after a time the flow will be checked at each inspiration, and then the body of the patient should be gently lowered into a horizontal posture, and turned slightly to the affected side, so as to bring the cavity directly over the opening. Should the stream begin again to flag, steady pressure may be made on the lower part of the chest, by an assistant grasping it on either side with the hand; but as soon as these means fail in procuring a continuous flow, the canula should be immediately withdrawn, whilst the chest is still compressed, so that the entrance of air may be prevented. The occurrence of this accident is known by a peculiar sucking noise being heard; and whenever this happens, it should be a signal for the immediate removal of the instrument. The wound requires nothing but the application of a small dossil of lint, and a strip of plaster.

It has been a question, whether the whole, or only a part of the fluid should be withdrawn at once; but opinions have appeared to settle upon the ancient mode of evacuating the fluid gradually, at successive times, closing the orifice in the intervals. In this manner, less irritation is induced in the morbid surfaces, and time is afforded for the gradual restoration of the lung from the effects of compression, and of the parietes of the thorax from their state of atony. In all such cases—and especially, perhaps, where an extensive surface has been secreting purulent matter—a recuperative action is set up, under which the system sympathizes, and the patient frequently sinks. It has been of late years a question, whether the admission of air into the cavities of serous membranes be productive of as much mischief as was at one time presumed. When the membrane is healthy, the negative of the question is undoubtedly accurate: it has been remarked, however, by Dr. Williams, that there is a vast difference between the result in a healthy and in a diseased serous cavity. In the former case, the air may be absorbed; but, in the latter, the membrane is covered by products highly disposed to decomposition, which—it has been conceived—must augment the irritative fever, and greatly interfere with the absorbing power of the membrane. Dr. Heyfelder, has, however, held,

that but little apprehension need be entertained, in morbid cases, from the admission of air into the pleural cavity; and he is favourable to discharging the fluid at once. When the fluid is purulent, it may be advisable to inject warm water into the chest, with the view of displacing it; and if, after repeated evacuations, there be no apparent disposition to the expansion of the lung, or the contraction of the chest, and matter continues to be secreted, it has been suggested to inject a very weak solution of nitrate of silver or other astringent, or chlorinated soda; and if the discharge be fetid, to correct it by injections of chlorinated solutions, mixtures of creasote, &c.; but it need scarcely be said, that all such applications must be used with the greatest caution, for fear, that inflammatory excitement may be lit up, which may not be easily subdued. A case of recovery after the injection of a weak decoction of oak bark once a day, after having drawn off the pus, has been recorded in the Western Journal of Medicine and Surgery for May, 1845, by Dr. W. C. Sneed, of Frankfort, Kentucky.

In the experience of Dr. Hughes and Mr. Cock, the operation of paracentesis has proved much more successful than in that of others. In a table they give an abstract of 20 cases of empyema, chronic pleuritic effusion, pneumothorax, &c., occurring in the practice of several gentlemen, and of which some records have been preserved: from these it appears, that in 10 the operation was followed immediately by great relief; in 6 by relief; in 3 there were no immediate effects; and in one the patient appeared in danger of suffocation, but ultimately recovered perfectly. Of the whole number of cases 7 were completely cured, and 3 recovered partially. Nine of the patients died; but, of these, 6 were phthisical, and no permanent good was anticipated from the operation; in 1, the fluid was not reached by the trocar; another was already sinking under the complication of pneumonia and pericarditis, when the chest was opened; and in the remaining case, in which there was hydrothorax of the other side, death took place rather suddenly, six days after the operation. One case still remained under treatment, when the table was drawn up. In no instance could the fatal event be said to have been hastened by the operation.

Dr. Hamilton Roe states, that on a review of thirty-nine cases recorded in the British Journals between the years 1812 and 1842, he found that only eleven had died. Twenty-four cases fell under his own observation, the results of which lead him to conclude, that the operation is as free from danger as any other performed on the human body, and that it is usually successful, when employed early, either in empyema or hydrothorax,—the common cause of failure being the late period at which it has been undertaken. A case has been reported by Dr. Thompson, in which it was repeated four times, and eventually with complete success, on a boy six years of age. Dr. Thompson advises a valvular opening and partial evacuation of the contents, especially when the discharge is purulent. He condemns the practice of leaving in the canula, which—as in a case related by Dr. Stroud—appeared to have converted a serous into a purulent effusion. But a still more remarkable case, in regard to the number of times the operation was performed, has been recently recorded by Dr. Hughes.

A gentleman was admitted into Guy's Hospital, in 1844, for thoracic disease, which had attacked him during a residence in New South Wales. He was greatly debilitated, with quick pulse, dyspnœa, and every sign of effusion into the right pleura. There was no prominence of the intercostal spaces, but a flat fluctuating tumour was observed, which dilated with the act of coughing. After a preliminary exploration, a small trocar was introduced, and twenty-four ounces of turbid serum were drawn off. He also took iodide of potassium and sarsaparilla, and so far recovered as to leave the hospital. He was readmitted in a fortnight, and although there was a manifest decrease of fluid, it was deemed advisable to repeat the operation, when thirty-six ounces were removed. No inconvenience ensued, and he again went into the country. On readmission into the hospital, a great improvement was perceptible. The circumference of the chest had diminished two inches, and the health was ameliorated. As fluid was still present, however, the operation was again practised, and at this time more than twelve ounces were removed. From this date, his improvement was uniform, and he left London. After two months, however, he was again admitted, presenting the following condition:—health good; pulse 108; respirations 21; but an increase of fluid in the pleura. Paracentesis was again performed, and thirty-six ounces of fluid were evacuated. He was again tapped on the 18th and 26th of November, and on the 21st of December; and finding that a frequent repetition of the operation had become necessary, he learned to perform it himself, and did so twice. The progress of the case was subsequently favourable, and after fifteen tappings his health became permanently re-established.

In the last stages of the disease, where the operation has not been performed for any reason, the accompanying dyspnœa is, at times, excessive. This may often be relieved by a slight stimulant, (*Sp. ætheris sulphuric. comp.* f 3j. in a little water,) which gives occasion to the expulsion of flatus from the stomach; and both in this case, and in hydrothorax, great relief is at times afforded by a stimulating glyster—as of turpentine, or asafœtida—which prevents the accumulation of flatus, and thus obviates any pressure that might otherwise have been made on the diaphragm.

c. *Typhoid Inflammation of the Pleura.*

Synon. Bilious Pleuritis, Typhoid Pleuritis, Pleuritis Typhoides seu Typhodes, Pleuritis Biliosa, Typhoid Pleurisy, Bilious Pleurisy.

The remarks that were made on typhoid inflammation of the lungs, are strikingly applicable to typhoid pleurisy, both as regards the diagnosis and method of treatment. It is apt to occur in the enfeebled and broken-down constitution, and may be secondary to some other morbid condition. The affection, too, is insidious, and the signs often latent,—being indicated rather by sinking of the powers of life than by any new suffering. Like typhoid pneumonia, again, although it forms suddenly, it is slow of removal; it is frequently combined with gastro-enteric disease;—hence, the epithet *bilious*, given to it at times;—and does not admit of active antiphlogistic treatment. It is observed as a secondary disease in the course of typhus or spotted fever, and of the

exanthemata, in puerperal fever, in typhoid arthritis, and diffuse inflammation; in bad forms of erysipelas; in phlebitis, and it has been conceived to be a consequence of purulent absorption. It would not appear, however, to occur frequently as a complication of typhus; for, of fifty-seven observed cases, according to M. Louis, it was noticed but once. Two such cases have been detailed by Dr. Stokes. In one, on the fourteenth day of a severe maculated fever, a sudden sinking was observed, with the friction sound or *frottement* over the left side. On the next day, the patient, a young female, had the appearance of an individual in cholera. She had perspired copiously, and was covered with a miliary eruption; there was severe orthopnœa, and she speedily sank. A double effusion had existed. The left pleura contained a large quantity of whey-coloured fluid; whilst, in the right, the effusion was more sanguinolent and serous. In both, lymph was found in a reticulated form over the whole serous membrane, and also in the pericardium. In many of these cases, the cavity of the pleura may be found to contain sero-purulent collections, although during life symptoms of pleurisy have been either absent or very slightly marked. At other times, however, the invasion of the disease is accompanied by severe pain. In all these cases, the physical signs, that denote effusion, will sufficiently indicate the nature of the affection.

Treatment.—The same cares and cautions are necessary in the treatment of typhoid pleuritis as in that of Typhoid Pneumonia, to which the reader is, therefore, referred.

II. PLEURODYNE.

Synon. Pleurodynia, Pleuralgia, Pleuritis Spuria seu Rheumatica seu Muscularis, Pneumonia Externa, Pseudopleuritis, Stethorrheuma, Dolor Pectoris Externus, Thoracodyne, Pain in the Side, Stitch in the Side, Bastard or False Pleurisy; *Fr.* Point de Coté, Douleur de Coté; *Ger.* Seitenstechen, Seitenschmerz, Falsche Seitenstich, Brustfluss, Rheumatische Seitenstechen.

Pain, at times, attacks the side suddenly, so as to give rise to a *stitch*, which continues for a time and then passes off; but, at other times, is of longer duration. It is of a neuralgic character, and appears to be seated rather in the muscles, or their aponeuroses, than in the pleura; and it may be distinguished from pleuritis by the absence, in the former, of the febrile symptoms, of dulness on percussion, of the friction sound, and the other signs and symptoms, that indicate pleurisy. There is generally, also, more or less soreness on pressing the muscles of the chest.

Pleurodyne is not unfrequently met with in nervous, hysterical persons, and, at times, occasions great suffering,—occasionally, indeed, as much as pleuritis itself. It is, also, an accompaniment of chlorosis; and, Dr. Hall remarks, is in such cases so like chronic pleuritis, that he has known patients to be bled and blistered for the twentieth time, under this erroneous impression. Yet the slightest attention to, and acquaintance with, the physical signs, would have shown the difference.

Treatment.—The treatment of this neuralgia must consist chiefly in revellents applied to the part affected—as cups, with or without the scarificator; sinapisms; hot applications—as salt heated, or a hot flannel; blisters, ammoniated lotions, &c.; and if the pain recur fre-

quently, the emplastrum belladonnæ, or emplastrum opii, or a *warm plaster*, containing a small quantity of cantharides or of the tartarized antimony, may be kept upon the part. Narcotics may, also, be required internally, when the pain is violent. They should be given in full doses;—for example, two grains and a half of soft opium in the form of pill, or a corresponding quantity of any of its preparations.

Should the disease be connected with hysteria, or with the anæmic condition that constitutes chlorosis, the remedies which are adapted for such morbid conditions, and are mentioned under those diseases, must be prescribed. M. Max. Simon has recommended emetics. Their good effects are, doubtless, owing to revulsion.

III. DROPSY OF THE PLEURA.

Synon. Hydrops pectoris, Hydrops thoracis, Hydrothorax, Stethochysis, Dyspnœa et Orthopnœa hydrothoracica, Dropsy of the chest; *Fr.* Hydropisie de poitrine, H. des plèvres, Hydropleurie, of Piorry; *Ger.* Brustwassersucht, Wasserbrust.

Prior to the time of Laënnec, idiopathic hydrothorax was esteemed an extremely common disease. It is now, however, as generally admitted to be rare. Dr. Stokes, indeed, remarks, that he has never seen a case of it; the accumulation being, in all cases, owing to disease of the heart, or lungs, or some of the solid viscera of the abdomen. As in the case of the effusion of pleurisy, the fluid is contained in the cavity of the pleura, and is essentially an accumulation of the secretion, which takes place from the pleura, and which, in health, is intended for its lubrication; and, like other hydropic accumulations, it may occur under three circumstances mainly:—in the *first*, the exhalent vessels may secrete more copiously than in health, or the hydrothorax may be "active:" in the *second*, the exhalents may pour out their proper quantity, but the vessels, whose office it is to absorb, may take up too sparingly; and in the *third*, there may be some obstacle in the heart, or elsewhere, to the proper return of blood to the centre of the circulation. In the two last cases, the resulting hydrothorax may be considered *passive*.

Diagnosis.—The symptoms and physical signs, which denote the existence of hydrothorax, are extremely like those of the effusion that takes place in pleurisy; so that it is not an easy matter to distinguish between a slight attack of acute pleuritis, and of active hydrothorax. Generally, however, along with dyspnœa, which is proportionate to the amount of the fluid effused,—with difficulty of lying on the affected side; and in cases of double hydrothorax, panting respiration, and difficulty of breathing, except when in the sitting posture, energetic action of all the respiratory muscles and extreme anxiety of countenance,—there is absence of the inflammatory and local symptoms of pleurisy, with more or less effusion into the cellular membrane, as evinced by œdema of the lower extremities, and the ordinary evidences of dropsy. The urine, according to M. Schönlein, is secreted scantily; is of a dark purple-red colour, and presents a fiery appearance. At the approach of recovery, it becomes more copious; and—especially when the disease is complicated with inflammation of the pleura or lung—throws down precipitates of a reddish-yellow or brickdust colour, which are frequently mixed with purulent mucus. In chronic hydrothorax,

according to M. Simon, a thick, fiery-red urine is generally passed, which speedily deposits a considerable sediment of a brickdust or rose-red colour: in some few cases a transparent urine, "like that which is passed in spasm, is discharged in tolerable abundance."

The physical signs are—dulness of the affected side, egophony, if the fluid be small in quantity,—(although egophony often exists when there is no fluid in the thorax,)—and absence of respiratory murmur in the part corresponding to the effusion, with the substitution of tubal respiration. The affected side is also larger than the other, and, according to general testimony, there is an enlargement of the intercostal spaces; and, at times, fluctuation has been distinguished; yet one eminent observer, Dr. Stokes, affirms, that he has never observed dilatation of the intercostal spaces or protrusion of the diaphragm in hydrothorax, and this fact he adduces, amongst others, as an argument in favour of his view of the cause of muscular displacement in empyema,—that in the latter the innervation of the muscles is implicated so that they become paralysed.

Causes.—These are the same as those of dropsies in general. The disease occurs at all ages, but is most common after the age of 40. It has been observed in the fœtus. As already remarked, however, it is commonly symptomatic of disease of some thoracic or abdominal viscus.

Pathological Characters.—The fluid of hydrothorax is like that of ascites. It is thin and limpid, and generally occupies but one pleura. Its quantity is very variable: sometimes, it amounts to many pints. Twelve pounds have been seen in one side of the thorax. The pleura is found to be healthy, but blanched by the fluid that bathes it; and the lung of the affected side is, of course, found compressed towards the vertebral column or the apex of the thorax, as in cases of pleuritic effusion.

It is not uncommon to see a quantity of fluid, varying from two to three ounces, and even more. These effusions are, indeed, nearly constant in those who die of disease of the heart, and especially of granular disease of the kidney.

Treatment.—As hydrothorax is commonly a symptomatic affection, it can only be met by remedies that are adapted for the removal of the primary mischief. To promote the absorption of the fluid, the general antihydropic treatment is desirable. As a part of this, revellents, especially such as act on the kidneys, are found highly serviceable, and great faith has been reposed in digitalis, especially when combined with opium.

R.—Tinct. digital. gtt. xl.
—— opii gtt. v.
Mucilag. acac. f℥iij.
Aquæ f℥v.—M.
Dose, a fourth part, every 5 or 6 hours.

It has been considered especially advisable in the asthenic diathesis, with debility, pallor and feeble pulse. All the diuretics elsewhere recommended, (see Hydropic Cachexia,) may be administered in this form of dropsy; and advantage is derived from occasional cupping and blistering the chest. Where all remedies have failed, and the

patient suffers great inconvenience from mechanical pressure by the fluid, the operation of paracentesis has been recommended, and performed; but it can only be had recourse to with the view of affording temporary relief, inasmuch as it does not modify the pathological condition on which the dropsical accumulation is dependent. There may be truth, however, in the suggestion of Dr. Prichard, of Bristol, England, that the practice of deferring paracentesis till all other means have been long tried, may be a powerful cause of the recurrence of the effusion. Dr. Prichard employs a grooved needle to evacuate the fluid, (see page 444.)

IV. AIR IN THE PLEURA.

Synon. Pneumothorax, Pneumathorax, Pneumatothorax, Physothorax, Pleuropneuma, Asthma aëreum à physothorace, Emphysema pectoris; *Ger.* Luftbrust, Brustwindsucht, Windgeschwulst des Brustfellsacks, Gas in der Pleura.

The phenomena presented by air effused into the cavity of the pleura are, in many respects, analogous to those produced by liquid effusions; and where they differ, the causes of the difference are readily understood. The disease may be either simple, or the air may be mixed with liquid (*hydropneumothorax*, *hydroaëropleurie* of Piorry.)

Diagnosis.—The patient complains of great dyspnœa, which is in a ratio with the quantity of air effused, and the rapidity with which the effusion occurs. The affected side is rendered prominent, but this is not always the case; and there is, over the whole, unusual clearness on percussion; or, if the patient be sitting up, the resonance may be marked at the upper portion of the chest, whilst it may be dull beneath, denoting the presence of a liquid. This unusual sonorousness is accompanied with absence of the sound of respiration, except near the root of the lung, where it is tubal.

When, along with pneumothorax, the pleura contains fluid, and there is a fistulous communication with the bronchia, the respiration may be markedly cavernous, and there may be more or less gurgling, with a peculiar sound, called *tintement métallique*, "metallic tinkling," or "ringing noise of metal." This sound is peculiar, but not constant, and although it is regarded by M. Andral as unexplained, it has nevertheless received many attempts at explanation. The view of Spittal, Beau, Puchelt, junr., and others,—that it is caused by a bubble of air from the open bronchium, which passes through the liquid, and bursts upon its surface, hence termed by the last of these observers, "bullar metallic tinkling," seems to be the most correct. It has been suggested, however, by Professor Bigelow, of Boston, that there must be a cavity, whose walls are preternaturally susceptible of vibration, as is the case when the pleura is preternaturally distended, so as to overcome the obtuse or muffling effect of the contiguous soft organs,—as the lung, diaphragm and intercostal muscles; and such may be the case. Dr. Bigelow considers the immediate or exciting cause of the metallic tinkling to be a forcible or sudden disturbance of the liquid in a vibrating cavity like that described,—the explosion of bubbles of air from beneath the surface of the liquid appearing to be the most

common cause of such disturbance; and this explanation seems to be as satisfactory as any that has been offered.

It not uncommonly happens, that when the patient changes his posture—as from the horizontal to the upright—drops of liquid adhere to the pleura, or are retained by false membranes, and subsequently fall upon the surface of the liquid, causing a noise similar to that which is produced by the falling of a drop of water into a decanter containing a portion of liquid. This is regarded as a variety of the *tintement métallique*, which may accompany the inspiration, the voice or the cough. Whenever, too, hydropneumothorax exists, if the thorax be shaken, the fluctuation of the liquid will be heard. This method of detecting the existence of fluid is as old as Hippocrates, and has been called "*Hippocratic succussion.*"

When the effusion of air, or of air and fluid, is considerable, there may be the same signs of displacement, or what has been termed *eccentric displacement*, as in the effusion of pleurisy.

The disease may terminate favourably by absorption, but this is a rare occurrence. As it is generally connected, however, with tuberculosis of the lung, the prognosis must be unfavourable; yet it does not necessarily terminate speedily. M. Andral remarks, that it may continue for some days, and even for more than a month. It has been known, according to Laënnec, to exist for six years, and in some cases, under the new morbid condition of the pleura, the tuberculosis of the lung appears to be arrested. In a case of phthisis with perforation, detailed by Dr. Houghton, the patient, a bricklayer, made several extraordinary rallies, during each of which he returned to his occupation. He lived upwards of a year. In another case, described by Dr. Stokes, a gentleman, after recovering from the first violence of the affection, gradually regained flesh, strength and appearance; the hectic totally subsided; the pulse became quiet, and he took exercise every day. He could trot or canter his horse, were it not for the "splashing in his chest," which annoyed him. Similar cases are noticed by others.

M. Becquerel examined the urine in eight cases of pulmonary emphysema, and found, when the disease was attended with violent dyspnœa, frequent cough, and much general disturbance, that the urine assumed the inflammatory type. He made one analysis of urine of this nature. It was of a dark-brown colour, had an acid reaction, but deposited no sediment. Its specific gravity was 1016·8. It consisted of,

			In 100 parts of solid residue.
Water	972·3		
Solid residue	27·7		
Urea	13·0		47·0
Uric acid	0·4		1·4
Fixed salts	4·3		15·5
Organic matters	10·0		36·1

Causes.—Pneumothorax may arise spontaneously, by the exhalation of air from the pleura, in the same manner as from the peritoneum; but this is probably a rare occurrence. It may, likewise, arise from a wound of the chest; but, most commonly, it is occasioned by some communication being formed from without—as from the lung—with

the cavity of the pleura. This may consist in a tuberculous excavation, with a fistulous opening into the pleura; or it may result from pneumonia terminating in an abscess, which has broken into the pleura; from gangrene of the lung implicating that membrane; from laceration of the lung or pleura by pulmonary apoplexy; from cancer of the lung; or, it is affirmed by M. Andral, from the simultaneous rupture of some of the pulmonary vesicles and pleura: any cause, in short, which opens a communication between the bronchia and the cavity of the pleura, may occasion it.

Pathological Characters.—Air is, at times, found alone in the chest; but more commonly—as before remarked—it is mixed with fluid, usually of a sero-purulent character. The gas may be inodorous, or fetid, and may consist of oxygen, or azote, or pure hydrogen, or sulphuretted, or phosphuretted hydrogen. In 70 cases, according to M. Andral, the affection was double, or on both sides, twice; 41 times on the left side, and 27 times on the right. Of late, Dr. Stokes communicated to the Pathological Society of Dublin the particulars of a case of extra-thoracic pneumothorax: in which, on dissection, a large cavity was found in the integuments in the situation of the tumour. This was lined by a thin membrane, and traversed by bands, resembling so far a tuberculous abscess. It communicated by a narrow fistula, passing under the capsular ligament of the shoulder-joint, and through the first intercostal space, with a very minute cavity in the superior part of the right lung, just at the place where cavernous respiration and metallic phenomena were audible during life. Dr. Stokes considers we are acquainted with three forms of pneumothorax —the common one, described above—a form in which air occupies a space between the pleura and the lung; and the extra-thoracic form.

Treatment.—It would not seem, that the mere communication of a bronchial tube with the cavity of the pleura ought to be necessarily fatal; but this simple case rarely presents itself. Usually, it is pneumothorax with tuberculosis of the lungs that we have to treat; and inasmuch as the latter is almost incurable, it cannot be rendered less so by combination with the former. It has been affirmed, indeed, by Dr. Stokes, that where pneumothorax has proceeded from the opening of a gangrenous or tuberculous abscess into the pleura, the chances of recovery are infinitely small; and that there is no instance recorded of such an event. Irritation may be allayed by opium and its preparations, and counter-irritants may be applied to the chest, from time to time. The efforts of the practitioner will, indeed, be mainly restricted to palliation.

When air accumulates in the chest, owing to the smallness of the opening of communication between the bronchial tube and the cavity of the pleura, so that oppressive dyspnœa is experienced,—a question arises as to whether it may not be advisable to puncture the chest, and let out the air. This has been done in several instances, and it is said, with great temporary relief. There is much difference of opinion, however, on this point: whilst one writer, Dr. C. J. B. Williams, affirms, that the risk of the operation is not great; another, Dr. Stokes, asserts, that in cases of great accumulation and distress, the relief is

much less than might have been expected, and there is great liability to gangrene of the pleura—a fact which he asserts he has repeatedly verified; and noticed that the "rapidity of the destruction of the serous membrane is truly singular." Where the disease has been produced by any of the forms of pulmonary mischief, referred to under the head of causes, and especially from tuberculosis, but little advantage can be expected from the operation. The disease will proceed on its course. As a means of permanent cure—like paracentesis for the removal of effused fluid simply—no benefit can be expected from it; and from what has been said, the physician will have recourse to it only after careful deliberation. It will be always well to choose a place for the operation beneath the surface of the liquid, if any be present, so that both the air and the liquid may be evacuated. It might seem, that little or no precaution is necessary to prevent air from being admitted, as the disease itself consists in the admission of air to the cavity of the pleura. It is air, however, that has undergone a change in its temperature before it has reached the cavity, and, therefore, is less likely to produce irritation. It is, consequently, advisable to prevent, as far as practicable, the entrance of air through the opening made by paracentesis.

V. PERFORATING ABSCESS OF THE LUNG.

A few remarks may be made here upon those cases, in which purulent collections form exterior to the lung, and afterwards perforate its tissue, so that they are evacuated through the bronchial tubes. They are cases of what has been called by Dr. Stokes "*Perforating abscess of the lung.*" These abscesses may be formed by purulent collections in the parietes of the thorax or abdomen, which may reach the lung owing to adhesion between the pleura costalis, and the pleura pulmonalis,—so as to form a fistulous communication with the lung; or, purulent collections in the pleura may open in this way; or abscess of the liver may make its way through the diaphragm, and be discharged in the same manner. Of this last form, the author met with two marked cases, both of which were fatal. Recovery, however, not unfrequently takes place.

VI. MORBID PRODUCTIONS IN THE PLEURA.

The pleura, like serous membranes in general, is liable to various other lesions of nutrition.

a. *Cartilaginous and osseous depositions.*—These are occasionally, but not frequently, met with. Commonly, the bony matter is deposited in thin plates, and cartilaginous deposits are usually found also. At times, calcareous concretions are observed in the fluid effused during chronic pleuritis. They are probably formed at the surface of the pleura, and become detached.

b. *Serous cysts.*—These are very unusual, but they have been observed; and, when numerous or large, they may give rise to all the signs of liquid effusion into the pleura. Not uncommonly, indeed, after—or in the course of—chronic pleurisy, the fluid is collected in

cysts, owing to pseudo-membranous *brides* or prolongations, which divide the cavity of the pleura into several compartments.

c. *Ulceration.*—This is an unusual occurrence in serous membranes, and when it does exist, it is probably dependent upon the breaking down of tubercles. In one case, described by Professor Gross, of Louisville, in which there were five large ulcers in the left costal pleura, the lung contained hundreds of tubercles, in every stage of development; and in the upper lobe, there was a large excavation, the margins of which firmly adhered around the principal ulcer of the pleura.

d. *Tubercles.*—These occasionally form in the pleura, and are generally associated with tubercles of the lungs. At times, they are so large as to compress the lung, but commonly they are of small size, varying from that of millet to that of hemp-seed. The author has frequently met with them, under both the above-mentioned circumstances. In cases of pleuritis, they occasionally form with great rapidity in the false membranes thrown out. Examples are on record, in which the false membranes have been found studded with tubercles, in persons who died of pleurisy of not more than a fortnight's duration.

e. *Cancer.*—Scirrhous and encephaloid masses are met with, at times, in the pleura; occasionally, in numerous small formations; but, at others, so large as to fill one side of the chest, compressing the lungs, and giving occasion to dulness on percussion, absence of respiratory sound, except along the great bronchial tubes, and great dyspnœa. These morbid productions form, also, in the mediastinum, so as to constitute "Cancer of the Mediastinum," which is denoted by pain under the sternum, sometimes excessively lancinating and shooting, with progressive emaciation, and the general symptoms of the cancerous diathesis. In other cases, pulsations have been felt; owing to the pressure of the tumour on the aorta, so as to lead to the belief in aneurism of the aorta; and, along with these, the sternum has become absorbed by the pressure, and an outward projection has been visible. The cases are, however, to be distinguished by the symptoms above mentioned, and the absence of those physical signs, which are shown, elsewhere, to indicate the existence of aneurism of the aorta.

In three out of five observed cases, according to M. Andral, cancer existed in other parts of the body.

f. *Tumours.*—In a memoir on the diagnosis of various thoracic affections, M. Gintrac describes several instances of steatomatous and tuberculous tumours connected with the pleura; and, recently, his son, M. Henry Gintrac, has collected together the histories of thirty-two cases of solid tumours developed within the chest, but not appertaining to or primarily connected with the thoracic viscera. The structure of these was different in different cases; sometimes encephaloid; at others, scirrhous; at others, tuberculous; and in several instances, steatomatous.

CHAPTER IV.

DISEASES OF THE MEDIASTINA.

INFLAMMATION OF THE MEDIASTINUM.

Synon. Inflammatio Mediastini, Mesodmitis, Mediastinitis, Pleuritis Mediastina; *Fr.* Inflammation du Médiastin; *Ger.* Entzündung des Zwischenfells, Mittelfellentzündung, Zwischenfellentzündung.

Inflammation of the cellular tissue in the spaces constituting the mediastina is uncommon; but still, examples of it are met with, especially in the anterior mediastinum.

Diagnosis.—The general phenomena are those of internal inflammation in general, but with less disturbance of the thoracic functions than if either the lungs, pleura, or heart were inflamed. The local phenomena are acute pain behind the sternum,—more or less deep according as the disease is in the posterior or anterior mediastinum—with special consecutive disorder in the respiratory or circulatory functions, provided the inflammatory tumour presses upon the trachea, or heart and great vessels. The diagnosis is at this period by no means easy. Almost always, however, the inflammation ends in suppuration, which may be indicated by the symptoms elsewhere described as generally denoting the supervention of suppuration. If the amount of pus be considerable, compression may be exerted on the surrounding parts, so that the heart may be pressed over farther towards the left side; and if the purulent collection be in the anterior mediastinum, it may be so placed between the sternum and the heart, that the pulsations of the heart cannot be heard over the sternum, and percussion over the bone may yield a dull sound. The matter pressing upon the sternum gives occasion to the absorption of that bone, or it may occasion the separation of the cartilage of the ribs from the sternum, or may escape at the edge of the bone in one of the intercostal spaces, or at the cartilago ensiformis. Occasionally, the abscess breaks into the cavity of the pleura, or it may increase in its original situation so as to destroy the parts with which it is in contact, and give occasion to serious and fatal disorder. The author was recently consulted in a case of tumour evidently containing purulent fluid seated externally to the sternum, the history of which led him to believe that the suppuration had taken place in the anterior mediastinum, and made its way through apertures in the sternum, which could be distinctly felt by the finger. The case was rendered the more interesting in consequence of the slight local inconvenience experienced at any time by the patient, and of accompanying irregularity in the heart's action, which appeared to be independent of the abscess. The abscess was opened by Professor Pancoast, but the patient being from the country, the author has not heard the particulars of the result, which, however, was favourable.

Causes.—These are, frequently, external violence over the sternal region, or caries or necrosis of the bone. At times, the disease is owing to pus which has travelled down from the neck. It is rarely produced spontaneously.

Treatment.—This is obvious. During the stage of inflammation, the ordinary antiphlogistic treatment should be adopted; and when pus has formed, it ought to be evacuated as soon as possible.

CHAPTER V.

ASPHYXIA.

Synon. Apnœsphyxia, Apnœa, Apneustia, Anhæmatosia, Pseudothanatos, Mors Apparens, M. Putativa, Eclysis Pneumocardiaca, Asphyxy, Suspended Animation; *Fr.* Asphyxie, Anhématosie (Piorry); *Ger.* Scheintod.

The term Asphyxia, in its original acceptation, means "want of pulse," (α privative, and σφυξις, "pulse.") In this sense, it was used by the old writers, and is still employed, occasionally, by the moderns. It is not many years since suddenly fatal cases of heart affection were described by Mr. Chevalier under the name *Asphyxia idiopathica*, and we find the term, even at the present day, extended so as to include every variety of suspended animation; but, in its usual acceptation with the best writers, like *apnœsphyxia*, it is restricted to cases of apparent death, which result primarily, and principally from the suspension of respiration; whilst *syncope* is commonly applied to death commencing in the heart, and *apoplexy* to the variety which is primarily dependent upon a suspension of the action of the brain. Of late years, too, the epithet *Asphyxia* has been applied to the conditions of malignant cholera, marked by pulselessness and other symptoms of collapse,—an extension of application, which the term would scarcely seem to admit, although many of the phenomena are present, which characterize asphyxia from suspension of the respiratory function.

In describing the phenomena and treatment of asphyxia, it will be convenient to refer, first of all, to them as they regard asphyxia in general, and afterwards to describe the different varieties.

I. ASPHYXIA IN GENERAL.

Causes.—Asphyxia, in the sense in which we employ the term, may be produced by any agency, that interferes with the due aeration of the blood. Of the necessity of a due supply of arterial blood, or of blood that has undergone such aeration, no one doubts; but its absence has not always been regarded as the main cause of asphyxia: on the contrary, the common belief has been, that the presence of unconverted, or, in other words, of black or venous blood in the tissues is positively deleterious, and that asphyxia is caused rather by its presence in the vessels, than by the absence of blood possessing arterial qualities. Assuming, for the present, that the former of the opinions is the more correct, it will be obvious, that mechanical or other impediments, which interfere with the necessary contact between the blood in the pulmonary vessels and atmospheric air, or air necessary for producing the conversion of venous into arterial blood in these organs, will be the cause of asphyxia.

Accordingly, any agency, which prevents the due expansion of the chest, by pressing upon its parietes,—as in the punishment occasionally inflicted by the Turks on their prisoners, which consists in burying

them up to the neck in earth or sand, and pressing the earth firmly around them,—or, as in that which has been directed by the tribunals of more civilized countries, by placing weights on the chests of the wilfully mute,—will prevent the due quantity of air from entering the lungs, and induce a most painful form of asphyxia. In the latter case, breathing might, for a time, be accomplished by the diaphragm; but, in the former, even this imperfect respiration is prevented by the firm pressure of the earth on the abdominal parietes, which necessarily prevents any descent of the diaphragm. It is obvious, too, that any disease, which mechanically interferes with the due elevation of the ribs, must produce more or less of this effect; as where water, or air, or other fluid, is effused into the cavity of the thorax, constituting the affections respectively known by the names *hydrothorax*, *pneumothorax*, and *pyothorax*; or where the lining membrane of the chest—the pleura—is inflamed, so that elevation of the ribs, or any attempt at elevation, excites intense pain. In the last case, however, the obstructed aeration is not as strongly manifested, owing to respiration being still carried on, although imperfectly, by the diaphragm.

Another cause of asphyxia is the insufficient supply, or total absence, of oxygen in the inspired air. Hence, extremely rarefied air, and various gases, which are not of themselves positively deleterious, may become negatively so. Unless the air contains a due quantity of oxygen, and that properly diluted by nitrogen, the change of the venous blood into arterial cannot be effected. In atmospheric air alone we find the admixture of these gases, in the requisite proportion. Unless this air be supplied in proper quantity, the beneficial conversion cannot be sufficiently effected, and asphyxia may equally ensue. The *negatively* injurious gases are,—hydrogen and azote, to which carbonic acid has been added by some, but its lethiferous influence is exerted in a somewhat different manner. The hydrogen and azote are capable of being respired for a short time, and they destroy, simply because they do not contain oxygen; but carbonic acid, as well as various other gases, in a concentrated state, cannot be breathed at all, producing, the very instant any attempt is made to inhale them, a spasmodic closure of the glottis. They belong, therefore, to a third set of causes, comprising those that produce asphyxia in consequence of their forming media that are incapable of being inhaled.

The *irrespirable* gases are,—carbonic acid, ammoniacal gas, chlorohydric acid gas, deutoxide of azote, nitrous acid gas, and chlorine. Different writers have classed under the same head, oxygen, carbonic oxide, protoxide of azote, carburetted hydrogen, sulphuretted hydrogen, and arsenuretted hydrogen; but these gases give rise to no symptoms resembling asphyxia. They are *positively* deleterious, and the only difference between their action and that of other poisons is, the part of the economy through which they make their impression. They are properly, therefore, poisons: they are capable of being breathed: they produce a train of morbid phenomena, which, in the case of some of the gases, rapidly supervenes, even if the gas be only allowed to come in contact with the skin, and they are no more the cause of asphyxia than would be the vapours of arsenic or hydrocyanic acid, if inhaled.

A last set of causes are those which mechanically prevent the entrance of air into the pulmonary organs, whether such obstacle be seated externally or internally. To this set belong—hanging, strangulation, and every variety of smothering; obstruction of the air-passages by the entrance of extraneous bodies, by the pressure of tumours, or by any morbid thickening of the lining membrane of the tubes. Any disease, too, which gives occasion to the effusion of blood or other fluids into the minute bronchial ramifications, and thus prevents the air from exerting its necessary action on the blood, produces death in this manner. Direct or indirect irritation, or paralysis of the pneumogastric nerves causes asphyxia and death, partly in this way, and partly by impairing the powers of the respiratory muscles. From the phenomena that follow the section of these nerves on both sides it would seem, that the first effect is exerted on the tissues of the lungs, which being deprived of the nervous influence they receive from the brain, are no longer capable of exerting their ordinary elasticity—or muscularity—whichsoever it may be. Respiration, consequently, becomes difficult; the blood, owing to defective oxygenation, no longer circulates freely through the capillaries of the lungs; the consequence of this is, that transudation of its more watery portions takes place, and occasionally effusion of blood, owing to rupture of the small vessels, or to transudation through their parietes; so that ultimately all communication is prevented between the inspired air and the blood in the pulmonary vessels. The conversion of venous into the arterial blood is completely prevented; the animal becomes *asphyxied*, and death is the inevitable consequence, because the mischief done to the nerves by the section cannot be repaired.

Diagnosis.—The general phenomena of asphyxia necessarily vary, according as the supply of oxygen is diminished or totally withheld; and according to the degree in which the supply is diminished. There are some slight differences, also, according to the precise mode in which the supply is cut off; but still, certain symptoms and appearances are met with in all.

When the access of oxygen is in any manner prevented, a few seconds elapse before any uneasiness is experienced; but, after this, a marked feeling of distress indicates the necessity for satisfying one of the most imperious wants—that of respiring—the *besoin de respirer*. This feeling soon becomes insupportable; the animal gasps and yawns repeatedly, and makes use of every effort to obtain a supply of the indispensable fluid. The whole body is agitated. The limbs quiver, and are convulsed, or thrown into tetanic spasms. Almost instantaneously, especially if respiration have been slightly practicable, and the supervention of asphyxia therefore gradual, the feeling of distress is attended by vertigo and stupor: the face becomes livid, especially the lips, and the orifices of the mucous membranes; and, at times, the whole surface assumes the same hue. The sensorial functions are suspended in a few moments; and, almost simultaneously, the muscles lose the power of contraction, so that the individual falls. In this state of apparent death, an obscure circulation alone exists in the great vessels, whilst the functions of the capillary system continue.

The præcordial region presents, at times, a dulness on percussion, which extends as far as two inches to the right of the sternum, and three inches above the space usually occupied by the right heart. This dulness, according to M. Piorry, is owing to the engorgement of the right cavities. Soon the circulation ceases, first of all in the larger vessels, and afterwards in the capillaries; and, with this cessation, the functions of secretion, nutrition, and calorification are arrested. The asphyxia has now become positive death.

Pathological Characters.—Examination of the body after death exhibits general lividity of the surface, and of the face more especially. The parenchyma of the different organs, especially of the liver, spleen, kidneys, and lungs, is filled with fluid, which is sometimes quite purple. The whole capillary system, indeed, is surcharged with blood of a dark colour, which is described by some writers as always fluid; but to this there are many exceptions. The blood appears to be wholly collected in the pulmonary artery, the right side of the heart, and the venous system generally, whilst the pulmonary veins, the left cavities of the heart and the arteries are empty, or contain but a small quantity of fluid. The appearances, however, differ somewhat, according as the respiration is at once obstructed, or has been executed, although imperfectly, for a time. In the former case, death ensues more promptly, and there is less suffering; and, on examination, the cutaneous capillaries and the various organs are less charged with blood, and the fluid is less exclusively collected in the venous system.

The appearance of the countenance has been looked upon as a means of discrimination in death from asphyxia, where there has been much previous struggling; but it is extremely fallacious. The mechanical obstacles to the return of blood from the head, in some forms of asphyxia, and the convulsive efforts in all, give rise to protrusion of the eyeballs, and to more or less distortion of the features, while life exists; but these signs usually disappear, so that when death has unequivocally taken possession of the frame, no indications of suffering may be perceptible in the countenance. It has been remarked by Dr. Copland, that where no obstacle exists to the action of the inspiratory muscles,—the obstruction to respiration being in the air-passages,—the efforts to renew the air in the lungs are much more convulsive and laborious; the anxiety is extreme, but of short duration, and is rapidly followed by abolition of consciousness, voluntary motion, and of the function of circulation. In this case, the writer quoted considers Shakspeare's description of the frightful physiognomy of Duke Humphrey, after death from suffocation, physiologically accurate:—

> "But see! his face is black and full of blood;
> His eyeballs farther out than when he lived,
> Staring full ghastly like a strangled man;
> His hair uprear'd; his nostrils stretched with struggling;
> His hands abroad display'd, as one that grasp'd
> And tugg'd for life, and was by strength subdued."

Many of these signs may, or may not exist, and this will be greatly dependent upon the length of time the mechanical violence may have

been applied. If the rope, for example, were removed prior to the coagulation of blood in the vessels, they might be entirely absent; but if kept on until all circulation—general and capillary—had ceased, the congestion of blood in the vessels, and the protrusion of eyeballs, might be present as in Duke Humphrey's case. Usually, however, whatever distortion or mark of suffering may have existed prior to dissolution, there is little or no evidence of it after the spirit has passed, when the features exhibit a placidity of expression—a "rapture of repose"—singularly contrasting with their previously excited condition. (See the author's *Human Physiology*, 6th edit. vol. ii. p. 682, Philadelphia, 1846.) The author has had different opportunities for examining the countenances of those who have been hanged, —where the rope has consequently been removed prior to the total abolition of the vital properties,—and in none of the cases were there, in the features, the evidences of suffering, that have been so often described—by poets more especially.

There is another symptom of asphyxia from mechanical obstruction to respiration, to which the author's attention was first directed by Dr. H. H. Hayden, of Baltimore,—viz. redness of the teeth, which cannot be removed by maceration, so as to have the whiteness restored. This is probably owing to the same venous congestion that is observable in the mucous membrane of the larynx and pharynx, and in the brain. The flow of blood in the veins of the teeth is arrested by the causes inducing the asphyxia, so that engorgement of the dental veins supervenes, with consequent transudation. (See the article *Asphyxia*, by the author, in the *American Cyclopedia of Practical Medicine and Surgery*, ii. 465. Philad. 1836.)

With regard to the duration of life in cases of asphyxia, or rather to the capability of resuscitation, it is impossible to say anything definite. When once the heart has ceased to beat, it is extremely difficult to restore it. We know nothing whatever of the cause of its action; but distension by an appropriate fluid appears to be indispensable: unless, therefore, we can succeed in causing the blood to be propelled from the lungs to the left side of the heart, so as to excite there the requisite stimulation, our efforts at resuscitation will be vain. Nor is that requisite stimulation easily effected by the conversion of venous into arterial blood. Mr. Erichsen found that artificial respiration could re-establish the circulation through the lungs after it had entirely ceased. In one case of direct experiment in which it was not commenced until thirty-seven minutes and a half after the ventricles had ceased to beat, the blood became rapidly oxygenized, and passed freely into the left side of the heart; yet he distinctly states, that he has never, in any one instance, been able by insufflation of atmospheric air to restore the contractions of the ventricles after they have once fairly ceased. But, although we may lay it down as a general rule, that where the action of the heart has ceased, in asphyxia, for a few minutes, we shall too often fail in saving the individual, much may depend upon a difference of resistance referable to age, constitution, corporeal condition, &c. It is probable, too, that the more slowly the state of suspended animation has been induced, the greater will be the

chance of restoration, the organs retaining longer the power of being reanimated. In some of the varieties, too, of asphyxia, lesions are apt to be produced, which inevitably destroy.

It is important to bear in mind the cases on record, in which resuscitation has been effected, as in drowning, after an immersion much longer than that, which we have laid down as usually sufficient to render asphyxia irretrievable; but, at the same time, we must unhesitatingly reject many of the marvellous stories that have been handed down to us on this subject, and which, strange to say, find believers even at the present day. Notwithstanding these traditionary histories, and the philanthropic recommendation, that our attempts at resuscitation should be continued for several hours in cases of asphyxia, it is but too true, that our efforts will generally be fruitless, after a perfect asphyxia of a few minutes' duration. On the occasion of a melancholy catastrophe at Albany, in the state of New York, (August, 1840,) when many persons were submerged, although some of the sufferers were removed from the water in less than five minutes, and, in two or three cases, respiration was imperfectly performed, in no single instance did the medical gentlemen succeed in their efforts at resuscitation. The public journals of Great Britain, in giving the particulars of a casualty on the river Lea, (September, 1840,) also mention, that although seven persons were taken from the water within three minutes, not one was resuscitated. At the coroner's inquest, a witness deposed, that he had been acquainted with the Lea for the last thirty years, and had seen many persons drowned in it, but that he had never known any one that had been submerged in its waters even for a minute recover from the effects of such submersion. (!) At Navarino, ample opportunity occurred for putting the powers of the best divers to the test. Dr. Lefevre witnessed the performances of those who were employed to fish up the relics of the Turkish fleet sunk in Navarino harbour. The depth to which they had to plunge was 100 feet; but though the Greek divers are, and have always been, famous for their powers, none of them could sustain submersion for two whole minutes together. Seventy-six seconds was the average period in fourteen instances accurately noted; and frequently, after reaching the surface, blood issued from the mouth, eyes, and ears of the swimmer. In general, these people can repeat their task three or four times an hour. According to Mr. Marshall, the best pearl-divers of Ceylon could rarely sustain a submersion of more than fifty seconds; whence, and from other observations, Mr. Alfred V. Taylor concludes, that asphyxia is probably induced, in most individuals, in the course of a few seconds, and that at the farthest it occurs from a minute to a minute and a half.

The pathology or theory of asphyxia has excited the inquiries of the physiological pathologist. Before attention was directed to the chemical phenomena of respiration, or to the changes produced on the blood in the lungs, it was generally supposed, that when respiration is suspended, the circulation ceases, owing to some mechanical obstacle existing in the lungs, or to their collapse; and this view was maintained even at a late period. It was soon, however, established,

that no such mechanical impediment exists to the passage of the blood through the lungs, even after the most forced expiration, and that it continues to circulate freely through them. Accordingly, Goodwyn rejected this hypothesis, and having properly appreciated the importance of the conversion of venous into arterial blood, and the necessity of a due supply of the latter for the maintenance of the circulation and of life, he supposed, that in cases of asphyxia, the blood, being no longer exposed to the influence of the air, and therefore retaining its venous character, is unable to stimulate the left auricle and ventricle to contraction; the heart, consequently, in his view, becomes, as it were, paralyzed, and dies first.

In Goodwyn's theory, no obstacle is conceived to exist to the circulation of the blood through the lungs: the cause of the asphyxia is the non-conversion of venous into arterial blood, and, as a consequence thereof, the arrival, at the left side of the heart, of blood not possessing those qualities that are requisite for exciting its cavities to contraction. This view of the phenomena of asphyxia met with considerable favour from physiologists, and was generally adopted, until the appearance of the Researches on Life and Death, of Bichat. That distinguished individual, equally with Goodwyn, ascribed the first link in the chain of morbid phenomena to the non-conversion of venous into arterial blood; but he rejected the idea of Goodwyn, that any paralyzing influence is exerted upon the left side of the heart, and attributed the whole of the phenomena to the *poisonous* effects of the venous blood on the different tissues of the body.

The theory of Bichat commanded universal assent for a long period, and M. Devergie considers, that it "alone merited the suffrages of all physicians." Of late years, however, it has been subjected to a fresh examination, the results of which have shown, that many of the views of Bichat have been too implicitly received, and that some of them must be unhesitatingly rejected. It is evident, that he attached too much importance to the presence of black blood in the different tissues, and that the mischief is rather to be ascribed to the absence of blood in the arteries. Were, indeed, the experiments and observations of Messrs. Edwards, Kay, and others considered insufficient to establish this, the singular phenomena exhibited by malignant cholera would complete the demonstration. They are calculated, indeed, to give the *dernier coup* to the theory of Bichat, and to shake all our ideas regarding the connexion of the sensitive and locomotive functions with the circulation and hæmatosis. Every one who has witnessed that strange malady, must have observed the nervous and muscular actions preserved until within a few moments of dissolution, when the whole of the vascular system has been so filled with black blood, as to render the surface blue, and when arterial pulsations, even in the larger vessels, have been imperceptible. These striking phenomena have led M. Magendie to affirm, that the contact of arterial blood is neither indispensable to cerebral action nor to muscular contraction; and Dr. Madden has gone so far as to assert, that the brightening up of the mind prior to dissolution, which is occasionally witnessed, but far less frequently than is imagined, is probably produced by the "stimulus"

of the dark venous blood circulating through the arterial vessels of the brain; but this idea is opposed to all received notions on the subject.

In opposition to the views of Bichat, it has been maintained by Drs. D. Williams and Kay, that the earliest effect of the interruption of respiration is to impede and arrest the circulation of the blood in the capillary system of the lungs. All the organs of the body, in Dr. Kay's view, consist of a congeries of small blood-vessels, denominated, from their minuteness, "capillaries." These vessels are possessed of peculiar powers, by which, in a healthy state, they admit only fluids of a certain quality, excluding those that are incompatible with the functions of the part. They even resist the forcible introduction of other fluids, when injected with a syringe. In the lungs, minute blood-vessels exist in an exquisitely delicate network. In these vessels, the venous blood is exposed to the influence of the atmospheric air; its qualities are changed; it loses its dark hue, and acquires a bright red colour; and hence, it is probable—Dr. Kay thinks—that the vessels in which arterial blood circulates must differ in their peculiar sensibilities from those which propel venous blood. The laws, generally observed to regulate the action of the small vessels in other structures, would, he conceives, be violated, if the vessels which usually convey arterial blood were able to convey, with equal facility, venous blood in every state of its changes, until it acquires its darkest colour. When air is no longer inspired, a considerable quantity of this fluid remains in the ultimate bronchial subdivisions, and so long as this air contains a certain portion of oxygen, the blood undergoes its proper change in the pulmonary vessels, and the circulation proceeds with its ordinary activity; but as the proportion of oxygen diminishes, the conversion is more and more imperfectly accomplished; the circulation becomes progressively feebler, and slower, "until," as remarked by Dr. Kay, "when venous blood enters those vessels which formerly conveyed arterial blood only, this degenerated fluid is no longer able to excite their action, and the circulation stagnates in the structure of the lungs. The pulmonary veins then discharge their last meagre supply through the left auricle into the left ventricle, which propels its last and feeblest tide into the arteries, in which the circulation has, every moment, become more scanty, until the pulsation has gradually been extinguished." In this way, Dr. Kay accounts for the congestion of the venous system, and especially of the right side of the heart, and of the pulmonary artery, whilst his theory equally explains the emptiness of the pulmonary veins, and the left side of the heart. The general conclusions which he deduces from all his investigations, are: *First.* That the circulation is arrested after respiration ceases, because, owing to the exclusion of oxygen, and the consequent non-arterialization of the blood, the minute pulmonary vessels, which usually convey arterial blood, are incapable of transmitting venous blood, which therefore stagnates in the lungs. *Secondly.* That the arrestation of the circulation is sudden when the lungs are entirely deprived of air, and that blood ceases to flow from them into the left cavities of the heart, even in the smallest quantity, in about three minutes and a half. *Thirdly.* That even supposing a great quantity of venous blood were

transmitted through the lungs, it would not impair their contractility; but, on the contrary, it is even capable of supporting this power for a certain period;—that venous blood does not possess any noxious quality, by which the organic functions of these tissues can be destroyed, but is simply a less nutritious and less stimulating fluid than arterial blood: and, *lastly*,—that the functions of the muscular fibres cease in asphyxia, because the circulation, and, consequently, the supply of the fluid which is necessary to life, is arrested in the lungs.

Since then, fresh experiments have been instituted by Dr. J. Reid, which do not accord, in all respects, with those of Dr. Kay. Dr. Reid concludes, that the suspension of the functions of the encephalon is chiefly, if not entirely, dependent upon the circulation of venous blood in the arteries. He does not, however, maintain, that venous blood exerts any noxious influence upon the functions of the nervous texture; but believes, that the effects are solely attributable to a want of the proper excitation of the organ; for when the circulation of arterial blood is renewed, its functions rapidly manifest themselves, provided this be done within a given time. He believes, that the order of succession in which the vital processes are arrested in asphyxia is as follows:—The venous blood is at first transmitted freely through the lungs, and reaches the left side of the heart, by which it is driven through all the textures of the body. As the blood becomes more venous, its circulation through the vessels of the brain deranges the sensorial functions, and rapidly suspends them, so that the individual becomes unconscious of all external impressions. The functions of the medulla oblongata are enfeebled about the same period that the sensorial functions are arrested, but are not fairly suspended for some time longer. Immediately after the sensorial functions are suspended, and the blood has become still more venous, it is transmitted with difficulty through the capillaries of the lungs, and, consequently, begins to collect in the right side of the heart. A smaller quantity of blood must now necessarily reach the left side of that organ; and this diminution of the quantity of blood sent along the arteries, conjoined with its venous character and the ultimate arrest of the circulation, being circumstances incompatible with the manifestation of vitality in the other tissues of the body, general death is sooner or later induced. This view, consequently, ascribes the phenomena of asphyxia chiefly to the circulation of blood that has not been oxygenated in the lungs, or, in other words, of blood devoid of the proper excitant agency, and subsequently, to arrest of the blood in the capillaries of the lungs, which occasions the flow of arterial blood towards the left heart to be arrested. As a consequence of the want of the stimulus of distension, the left cavities lose their contractility; the right auricle, which continues for a time to receive blood by the venæ cavæ, being the *ultimum moriens*. The nervous, muscular, parenchymatous, and other tissues, no longer receiving a supply of arterial blood, cease also to act; but those organic functions, which are effected in the capillaries of the general system—as nutrition, secretion, and calorification—yield last; circulation continuing in the capillaries for some time after it has ceased in the larger vessels.

These are probably the chief agencies concerned in the phenomena of asphyxia. Were the view of Bichat adopted, we might vainly attempt resuscitation by inflation of the lungs, seeing that every tissue, even that of the heart, has been poisoned to the total destruction of its irritability; and this has generally been regarded as a powerful objection to the view of that distinguished physiologist.

Treatment.—An attentive consideration of the different phenomena of asphyxia, presented during life as well as after death, and a comparison of these phenomena with the theory they seem so naturally to suggest, will leave but little doubt in the mind of the practitioner as to the general resuscitative measures he ought to adopt. Still, there are many particulars on which doubt might be indulged, and on which, indeed, a diversity of opinion exists among therapeutists. The general indications will consist—*first*, in removing the individual from the causes that have produced the asphyxia; and, *secondly*, in endeavouring to restore respiration, circulation, and innervation—the great vital functions, which mutually react on each other, and therefore require the simultaneous application of remedies adapted to each.

The consideration of the mode of fulfilling the first indication will necessarily fall under the examination of the particular varieties of asphyxia, as it must differ in each variety.

The chief means for fulfilling the second are,—to expose the body to that degree of heat which experience has shown to be best adapted for the support of the vital powers, and simultaneously to attempt to restore the suppressed respiration. From certain experiments, instituted on different classes of animals, by Dr. W. F. Edwards, it would seem to result, that an elevated temperature of the body exhausts the nervous action, unless the animal is able, at the same time, to have a due supply of air, and that there is a temperature, remote from the extremes of too great heat, and too great cold, which is best adapted for the recovery of those in whom respiration has been from any cause arrested. When the management of the different varieties of asphyxia falls under consideration, this subject will have to be again referred to, in its relation to each; and its bearings on the asphyxia of the newborn infant, or of one thrown into a state of suspended animation in the first few days of its existence, will be strikingly apparent. In all varieties of asphyxia, a temperature at all approaching that of the body, —and a higher than this was at one time recommended by the Royal Humane Society of London, whose directions are the rule of conduct over every part of Great Britain at least,—must, for the reasons assigned, be positively injurious, and *à fortiori* if such elevated temperature be applied through a medium, that shuts off from the skin the vivifying influence, which the contact of air is capable of exerting. In but few cases can it be safe to have the air of the apartment higher than 75° or 80°. *Radiant* caloric, where caloric is demanded, is manifestly to be preferred to the *conducted*,—unless its application, in the latter way, be partial, so as not to interfere greatly with the free exposure of the surface to the contact of air. The body may be placed before the fire, or in the sunshine; and warm flannels, or bags of warm grains, or of salt, or sand; or bottles of warm water, or warm bricks,

may be placed on small extents of the cutaneous surface. A proper temperature might be applied to the back by the tin mattresses, filled with warm water, used during the prevalence of cholera in several of the cholera hospitals. In this partial mode of applying warmth, sufficient surface is allowed for the action of the air, as well as for the employment of friction, which, with some other agencies, and especially that of artificial respiration, are the grand means for restoring suspended animation.

It was remarked, that the application of warmth must be made simultaneously with another operation—insufflation—the most essential, indeed, of the appliances and means that have been recommended for the removal of asphyxia. It must be recollected, that in this condition, respiration and circulation are suspended, and that innervation, which requires the integrity of these two functions, is almost annihilated. Irritability, however, still exists, and the blood-vessels, and the cavities of the heart, contain venous, and usually liquid, blood. Unless, indeed, this were the case, and if fibrinous concretions had formed in the cavities and in the great vessels, all attempts at resuscitation would manifestly be fruitless. In all these cases, death supervenes on the arrestation of a single vital function intimately catenated with the rest; but views have differed regarding the first seat of death; fortunately, under every view that has been entertained in modern times, the same plan of management has been inculcated. At one period, it was universally supposed, that death, in drowning, is owing to the oppression of the water swallowed; but as soon as the labours of observers showed that this was an error, and that death results from the privation of air, pulmonary insufflation was recommended. The theory of Goodwyn, as before shown, maintained, that the contractile power of the left heart is destroyed, owing to venous blood being sent into it. Accordingly, insufflation was proposed to change the quality of the blood of the pulmonary veins, sinus venosus, and auricle, to blood capable of arousing the left heart to contraction. Goodwyn's erroneous views of the nature of the affection led him, however, to the injurious recommendation, to introduce a large quantity of air at each inflation—upwards of 100 cubic inches, for example, in the case of the adult;—a recommendation which, if universally embraced, could not have failed to be followed by the unhappy consequences that are found to result from an injudicious employment of artificial respiration. Bichat, Kay, —and indeed every author on the subject, whatever may be the theory he adopts,—equally recommend its employment. Under the view embraced by Dr. Kay, it is clearly the most philosophical plan of treatment that could be devised. Asphyxia, according to him, essentially results from the privation of air preventing the due conversion of venous into arterial blood; and, as a result of this, stagnation takes place in the pulmonary capillaries. To remove such stagnation, and re-establish the flow, this conversion must be effected; after which, arterial blood makes its way through the vessels adapted for it, but which did not allow the passage of venous blood; and, in this way, the circulation, when it has not been too long suspended, may be restored.

The most simple mode of employing artificial respiration is that

proposed by M. Leroy, which has since been described, at length, in the reports of the Royal Humane Society of London. It has a signal advantage of being available in cases where no professional individual is at hand, and can always be employed without the slightest apprehension of evil. A piece of strong flannel, an old blanket, sheet, or other cloth, most easily attainable at the moment, is to be cut of the following size, and in the following manner. It should be six feet in length, and in breadth eighteen inches. Six strips are then to be cut or torn lengthwise on each side. Each strip is to be three inches broad, and two feet long. The untorn portion (two feet in length, and eighteen inches broad) is to be placed under the back of the patient, from the armpits to the upper part of the thigh bones. The strips are then to be brought together over the chest and abdomen, interlacing each other from the opposite sides, as the fingers are interlaced in clasping the hands. The strips, thus arranged, are to be gathered into a bundle on each side; and if they be then drawn in opposite directions by two assistants, the edges of the bandage will be made to approach, and firm and equal pressure will be produced on the chest and abdomen. The assistants—having thus compressed the body of the patient by drawing the bandage in opposite directions—should then relax it, permitting the chest to re-expand, and perform this process at the rate of about twenty times in the minute. If the head and shoulders be elevated, the contents of the abdomen, on the relaxation of the pressure, will cause the diaphragm to descend by their gravity, and will thus enlarge the chest. By applying the flame of a candle, or the fine down of a feather, to the mouth and nostrils, it will be seen, that on each firm pressure by the bandage, air is expelled from the lungs; and on the relaxation of this pressure, the chest regains its original size, and air rushes in.

Such is the plan, which may be had recourse to almost from the first moment that the body is discovered, and whilst any other means are in preparation from which more beneficial effects are anticipated; but, as soon as it can be accomplished, a more effective method of re-exciting the respiratory movements should be adopted. The pipe of a pair of bellows may be inserted into one nostril, whilst the mouth and opposite nostril are closed by an assistant, and the windpipe, in the superior prominent part, commonly called *pomum Adami*, is gently pressed back. Then, by forcing air into the lungs, and alternately expelling it by pressing the chest, respiration may be imitated. In this way, air may be sent into the lungs about twenty times in the minute, so as to imitate natural respiration as nearly as possible.

Another, and a more satisfactory method of insufflation, is, to pass into the larynx a bent silver canula, the larger extremity of which can be attached to the end of a flexible tube, so as to admit of a ready execution of the process. The finger must be passed towards the root of the tongue, on which it must press; in this way, the epiglottis is raised, and by carrying the canula along the finger, it readily slides into the larynx. Where none of the apparatus described is at hand,—but this can rarely happen, for in almost all situations, a bandage, of the kind recommended for establishing artificial respira-

tion, can be met with,—it has been advised, that air should be forcibly blown into the lungs, by applying the mouth of the operator to that of the patient, closing his nostrils with one hand, and gently expelling the air again, by pressing the chest with the other, or by the aid of an assistant; and if any difficulty be experienced in this method, air may be blown in at one nostril, keeping the other closed, and pressing the larynx back upon the œsophagus, in the mode already described, so as to prevent the introduced air from passing down into the stomach; or one of the curved canulas may be introduced, and air sent through it. But this method has not met with the approbation of every observer, and for obvious reasons. When the air issues from the lungs of an individual, it has experienced such a change in its composition as to be no longer adapted for continued respiration. It has ceased to be the appropriate fluid—atmospheric air—for the maintenance of the respiratory function, as experiments on animals sufficiently demonstrate. On the other hand, the introduced air has its temperature elevated, so that the advantage of the higher temperature, it has been conceived, may nearly counterbalance the disadvantage of less purity; but this may be advantageous or disadvantageous according to the case. It is more than doubtful, indeed, whether in any case of asphyxia, in the adult, the application of a temperature of upwards of 90° to the body can be useful. It has been considered, that the danger or dread is slightly exaggerated, as the air is so little changed; and moreover, in spite of every precaution, where a tube is not used, the air must pass, more or less, into the pharynx and even into the œsophagus, so that it cannot enter in quantity into the lungs. The advantages, however, attending the insufflation of the pure air of the atmosphere, are so overwhelming, that it ought always to be adopted, when practicable. There is, indeed, one variety of asphyxia where such deteriorated air can hardly be looked upon as so objectionable—the asphyxia of the new-born child, or of one that has respired but for a short period. The presence of a full portion of oxygen is not here so indispensable as it is afterwards; but this variety will have to be considered hereafter.

At one period, pulmonary insufflation was universally practised, and without the slightest caution. It was even recommended, as has been observed, that the air should be *forced* into the lungs so as to penetrate the minute air-cells. Experiments have, however, shown, that although a moderate inspiration favours the passage of the blood through the lungs, great distension by air checks almost entirely the circulation through them, by the mechanical compression of the vessels. In recent times, too, it has been shown, that the apparently simple operation of inflating the lungs is not as devoid of danger as was for a long time imagined; and it has been attempted to prove, that many cases may have resulted fatally from the violence of the insufflation, and consequent lesion of the pulmonary structure. Some of the statistical evidences on which this opinion is founded will be given under the head of *Asphyxia from submersion.* Bichat had remarked, that where air is forced violently into the lungs of an animal, infiltration of air may be produced owing to rupture of some of the pulmonary vesicles, and, within the last few years, a series of

experiments has been instituted by Leroy d'Etiolles, which have confirmed the observations of Bichat. He found, that if air was blown into the lungs, and with no greater strength than that of an expiration from the human lungs, it proved fatal to rabbits, foxes, goats, sheep and other animals. The experiment was performed by briskly inflating the lungs from the mouth of the operator. All animals were not, however, equally affected by the operation. The tissue of the lungs of the dog, for example, is denser than in the animals mentioned, and, therefore, resists the insufflation better; and the same remark applies to the lungs of infants, which were not lacerated, even when the inflation was practised with considerable force,—a fact which was confirmed by the experiments of others. Similar experiments, made on the dead bodies of adults, exhibited that a like rupture of the air-cells could be effected by simple oral insufflation. Where the pulmonary vesicles are ruptured in this manner, the air passes into the cavity of the pleura, and presses upon the lungs, so that they cannot be inflated, unless the effused air be removed by a puncture made into the chest, and reinflating the lungs by the trachea. A *post mortem* examination of many of the cases, that proved fatal after insufflation, sufficiently exhibited their true pathology; the diaphragm being found pressed into the abdomen, so as to form a prominent elastic tumour in that cavity, and the lung contracted into a small space in the chest. In experiments on animals, relief was afforded by making a puncture through the parietes of the chest, immediately after brisk insufflation had been practised, and thus permitting the effused air to issue from the cavity of the pleura. The animals, treated in this manner, recovered, although they exhibited much embarrassment in breathing for some hours. To remedy these inconveniences, Leroy recommends a modification of the resuscitative apparatus. He employs the double-valved bellows of Hunter, to the handles of which he adapts the graduated arc of a circle. One end of this arc is attached to one handle of the bellows, whilst the other passes through a mortise-hole in the other handle. The extent to which the handles are separated is measured by the graduated arc, and thus the quantity of air sent into the lungs may be determined. With this bellows, Leroy measured the quantity of air expired, without effort, into a bladder, by persons of different ages, and marked upon the arc of the circle the point to which the handle of the bellows was raised in each. He moreover had the curved tubes, to be introduced into the glottis, made of a different calibre, according to the age, so as to render it impossible to introduce the proper quantity of air, as indicated on the arc of the bellows, more rapidly than it would be inspired at that age. The apparatus is simple, and its adoption has been properly and strongly advised, on the ground, that verbal directions often fail to impress the mind with a due sense of the dangers attending insufflation, especially when it must be performed in such excitement, and confusion, as cannot fail occasionally to diminish the caution even of experienced persons. In most of the cases of asphyxia, however, that occur, no such apparatus can be at hand, and the operator is consequently constrained to make use of the

agents which present themselves. These should of course be employed with the greatest precaution, to prevent the evils that have been depicted by Leroy.

In adopting any form of insufflation, it is important to imitate, as far as possible, the natural movements of inspiration and expiration; not to go on incessantly forcing air into the lungs, but, by means of the pressure before mentioned, to force the air from the chest before a fresh quantity is sent in. This is one of the strong objections that may be urged against the plan, which has been recommended, where difficulty is experienced in introducing a curved tube into the glottis,—of making an incision into the windpipe, and inserting the nozzle of the bellows into it, so as to maintain artificial respiration. In order that expiration shall be accomplished, the nozzle must necessarily be alternately withdrawn and inserted, so that great violence must be done to the parts. A fatal case of this kind has been recorded by Mr. Franks.

Lastly, it has been recommended to substitute oxygen gas for atmospheric air, and that the resuscitative apparatus should contain a quantity in a well-stopped bottle. But, although it might seem probable, that the substitution of oxygen would be advantageous, so few cases of its employment are on record, that a respectable surgeon, Mr. Armiger, when about to prepare a work on suspended animation—which has not yet seen light—solicited from the profession accounts of cases successfully or unsuccessfully treated, but his call was not responded to. Goodwyn employed this gas in several instances in asphyxia of the smaller animals, and he thought, that recovery was commonly more expeditious than when atmospheric air was used; but at the same time he admits, that he had never been able to resuscitate an animal by oxygen gas, after atmospheric air had been vainly employed. Mr. Erichsen, too, has recommended it in cases of asphyxia from drowning. We can readily appreciate the principle on which inflation with oxygen gas should be recommended; but it is not so easy to comprehend that on which a mixture of 80 parts of atmospheric air and 20 of chlorine should have been advised, by Ackermann, unless it were upon the same principle that Hunter advised the inhalation of stimulating vapours. The recommendation appears, however, to have fallen still-born from its originator. Agents of this kind were sure to have early suggested themselves. The vital powers being suspended, or, as it was conceived, in a state of torpor, excitants would naturally seem to be demanded in every case of asphyxia.

Friction has been advised by all, although its importance, even as an auxiliary means of restoring life, has been much overrated. It can, of course, be of no use where the circulation has entirely ceased in the capillary vessels; but, in such a case, all applications would probably be equally unsuccessful; when, however, even an obscure circulation goes on in them,—and we have seen that this may be the case for some time after the action of the heart has ceased,—the remedy is certainly philosophical, if used with the more important means already considered.

The effect of frictions, like that of local excitants in general, is to produce rubefaction, or, in other words, to solicit the blood into the

extreme vessels, so that an impulse is thus communicated to the greater and more important parts of the vascular system; whilst the excitation of the subcutaneous nerves is communicated to the brain, and thence to every part of the organism. In such cases, therefore, as admit of any hope of relief, the employment of friction may be strongly inculcated. It may be applied with the naked warm hand, previously dipped in flour, to prevent abrasion,—or by the flesh-brush. The part of the body that may be selected with this object is not material, but generally the extremities are recommended. Various other excitants have been advised, such as tickling the nostrils or the fauces with a feather; applying spirits of hartshorn or aromatic vinegar to the Schneiderian membrane by the same instrument; burning sulphur under the nose of the patient, as well as other volatile irritants; but they can be of little or no benefit until the sensibility is restored by other means,—and then they are probably unnecessary. With similar views, brandy and water, or hartshorn and water, or negus, have been thrown into the stomach by means of the stomach tube; and irritating turpentine or spirituous enemata, or salt, or vinegar, or chlorate of potassa in solution, have been administered in the same form. Their use can only be productive of benefit under like circumstances, and they had better be cautiously employed in all.

The effect of electricity, in the different forms in which it is adopted in medicine, on the functions of sensibility, and muscular contraction, could not fail to suggest it early to observers as a means for restoring suspended animation. It is doubtless a most valuable agent, but it is rarely available, for reasons that are obvious. It has been strongly recommended by the latter gentleman on the strength of numerous experiments on animals. As the object, in these cases, is to arouse the respiratory muscles to action, the electric shock may be passed through the shoulders, or through the chest in any direction. Neither common nor galvanic electricity is possessed of any power in restoring the action of the involuntary muscles. The author has frequently attempted to re-excite the action of the heart, intestines, fibres of the uterus, &c., soon after the cessation of respiration and circulation, by means of the galvanic stimulus, but without the slightest success, although the voluntary muscles responded to it most energetically. Besides, were the action of the heart to be re-excited by it, this could be but momentary. An appropriate stimulating agency is distension, and unless the respiratory movements were restored, and conversion of venous into arterial blood effected, so that the latter could reach the left heart, the action of that organ could not be maintained. Every attempt, therefore, is properly made to restore the action of the respiratory muscles, so that hæmatosis may be accomplished. It has been advised, that the great nerves should be exposed in the neck; and that whilst the wire, connected with one pole of a galvanic battery, is applied to the pneumogastric nerve, for example, the other wire should be placed on the epigastrium. It is unnecessary, however, to expose the nerves, for experiments have sufficiently shown, that the galvanic influence is strongly exhibited when the integuments are left entire. As the intestinal tube retains its excitability for a long

time, it has been recommended to pass the galvanic current through the tube, by placing one of the poles in the pharynx and the other in the rectum.

A new method of application has been suggested by M. Leroy d'Etiolles, which, at the first aspect, appears to be most formidable, but is really less so than it seems, in consequence of the impunity with which fine needles can be made to penetrate even the most important organs. He introduced an acupuncture needle on each side, between the eighth and ninth ribs, until the needles reached the fibres of the diaphragm. He then established a galvanic current between these, by means of a pile of twenty-five or thirty pairs of plates, an inch in diameter. The diaphragm immediately contracted, and an inspiration was made. He now interrupted the circle, when the diaphragm, urged by the weight of the abdominal viscera, and aided by gentle pressure made on the abdomen by the hand, returned to its former position, and an expiration was accomplished. In this way, the two respiratory acts were made to succeed each other, and regular respiration was reinduced. A continuous current was, likewise, applied in some cases, but the respiratory movements were irregular, and nothing like natural respiration resulted. M. Leroy tried his method on animals asphyxied by submersion, and when they had not been under water more than five minutes, they were often resuscitated. The experiments were witnessed by Magendie. On different occasions, M. Leroy asphyxied animals of the same species, and apparently of like strength, and whilst those that were left to themselves perished, those that were treated by galvanism recovered. A case has been published, in which the galvanic influence, from a battery of fifty plates, was applied immediately to the diaphragm, through an incision made below the seventh rib. The muscles of the chest and abdomen were instantly thrown into spasmodic action, which subsided in a few minutes, into the regular movements of respiration. The man had been six or seven minutes under water. As an aid, therefore, to pulmonary insufflation, and an important one, galvanism might be advantageously employed in asphyxia; but, as has been already remarked, it can rarely be advisable. Certainly no time should be lost in adopting the other energetic and indispensable measures that have been already advised. It has been recommended, that as only a very small apparatus is necessary, batteries, consisting of a few plates, might be kept wherever there are station-houses for the reception of persons in a state of asphyxia. The suggestion is good; and they might with propriety also form a part of the cabinet of apparatus of the private practitioner; but whilst an assistant is preparing it for action, the practitioner should be energetically engaged in using his other means of resuscitation. The employment of galvanism has likewise another advantage, in cases of asphyxia,—in being a test of the presence of excitability or irritability. Where none is evidenced, death is absolute.

The operation of bloodletting requires much caution, when practised to anything like the ordinary extent; but there are, perhaps, few cases of asphyxia, in which blood can be abstracted, where the loss of a few ounces would not be beneficial, along with other resuscitative mea-

sures. The venous system is always surcharged with blood, and the removal of this quantity could scarcely fail to aid in the re-establishment of the circulation, without the danger that has been apprehended, of its extinguishing vitality. It is a measure, however, regarding the propriety of which, much difference of opinion has existed. Mr. Hunter strongly reprobated it, and the Royal Humane Society, of London, recommend the "utmost caution" in its employment. On the other hand, a modern writer, M. Wagner, regards the removal of the oppression of the encephalon, owing to the accumulation of blood in its vessels, as the *second* indication to be fulfilled in many kinds of asphyxia, the *first* being the restoration of the circulatory and respiratory movements. It has already been remarked, that the abstraction of some ounces of blood must usually be beneficial in aiding the restoration of the circulation; but the grand evil, after all, is the deficiency of fluid sent by the arteries, which bleeding can only rectify indirectly, by aiding in the re-establishment of the circulation. M. Devergie has affirmed, that when the individual has only just lost all consciousness, a "large bleeding" may produce the most satisfactory results, and that if it cannot always be employed at the first, it often facilitates the restoration of the circulation, when attempts at respiration are made. The general reprobation of bloodletting, in asphyxia, seems scarcely warranted; and, indeed, as we have already said, there are, perhaps, few cases in which a moderate abstraction of blood would not be beneficial. By some it has been advised, that blood should be drawn by cupping from the dorsal, epigastric and hypochondriac regions.

Such are the chief remedial agents employed in asphyxia. Nothing has been said of stomach-brushes, and stomach-mops, for stimulating that organ; of the internal use of phosphorus; of the instillation of hot water on the head, scrobiculus cordis, genitals, spine, &c.; the dropping of hot sealing-wax on the head; sticking needles under the nails; the application of the actual cautery, &c.,—because these are forms of excitants, from which but little good could, in any case, be expected, whilst there are others that are more appropriate in all.

With regard to the length of time that the resuscitative measures should be continued, it is difficult to lay down any precise rule. We shall find, when the particular forms of asphyxia are considered, that, in some, restoration appears to have been effected after a greater lapse of time than in others, so as to have given rise to the idea, that the impression made on the nervous system by the cause producing the asphyxia, may have occasioned syncope rather than true asphyxia. Under the possibility, that restoration may still be accomplished in very unpromising cases, it has been advised, that the means should be persevered in for several hours, and, indeed, until cadaveric rigidity begins to appear. A good deal must necessarily depend upon the length of time the individual has been exposed to the agency that has occasioned the asphyxia; and the practitioner, in every case, will have to be guided by his own judgment as to the probability of success from the application of any restorative measures; bearing in mind the cases on record of recovery after a long suspension of the vital mani-

festations, but, at the same time, recollecting that such fortunate examples are extremely rare. Occasion, however, will present itself for a recurrence to this subject.

When the resuscitative measures are beginning to be successful, slight convulsive snatchings of the respiratory muscles take place at longer or shorter intervals; with gaspings, sighing, slight fluttering at the heart, palpitations; and afterwards regular perspiration and circulation. The patient should not be abandoned by the practitioner immediately after resuscitation has occurred, as, in consequence of the condition in which the encephalon has been placed, during the existence of asphyxia, and the irregular movements occurring during the recovery, delirium or convulsions may supervene. A case is given in a respectable French periodical, in which the most furious delirium came on immediately after resuscitation from drowning, and where bloodletting appeared to be clearly indicated. The propriety of bleeding will have to be judged of by the presence of the usual signs, that denote increased action of the encephalic vessels.

The case of a corporal of the guards is given, who was seized with cramp as he was bathing, and remained for several minutes under water. By judicious assistance he recovered, and appeared to those about him to be free from danger, when he was attacked with convulsions and expired. It has been suggested by Dr. Roget, that if the respiration had been artificially supported at this period, so as to have maintained the action of the heart until the black blood had returned from the brain, the life of the soldier might, probably, have been preserved; but it is more likely, that some lesion had taken place in the encephalon, consequent on the modified circulation in that viscus, rather than on the presence of black blood in the vessels, which must have been sent back towards the heart from the first re-establishment of the circulation,—and this view is confirmed by the fact, that convulsions sometimes occur a considerable time after recovery has, to all appearance, been effected. Various inflammatory symptoms are apt to supervene, owing to the same irregularity,—which must be met as they arise, until the functions are restored to the healthy condition.

II. VARIETIES OF ASPHYXIA.

The remarks made in the history of asphyxia in general will render it unnecessary to dwell, at any great length, on the different varieties. Respecting the number of these, the greatest discrepancy has existed, in consequence of the difference of latitude given to the acceptation of the term. The causes, previously referred to, will guide us in establishing a few varieties:—*first*, those that arise from any mechanical obstacle to the due expansion of the chest;—*secondly*, such as are dependent upon an insufficient supply, or upon total absence, of oxygen in the inspired air;—*thirdly*, those that are produced by irrespirable gases;—and *fourthly*, such as are owing to any mechanical cause, which prevents the entrance of air into the lungs.

a. *Asphyxia from mechanical obstacle to the expansion of the chest.*

The brief mention that has been made of the first of these, will be

sufficient. It can rarely happen, that asphyxia is induced by any extrinsic cause, that can prevent the due expansion of the chest in inspiration, and therefore, as a question of therapeutics or of legal medicine, it is possessed of but little interest, whilst its pathology does not differ from that of asphyxia in general. As, however, death takes place in consequence of imperfect hæmatosis, and supervenes gradually instead of suddenly, as in many of the other forms of asphyxia, the evidences on dissection may be more equivocal: there may not be the same extent of fulness in the right heart, or of vacuity in the left; nor ought we to expect these extravasations into the lungs or encephalon, which are so common whenever the circulation from the right side of the heart to the left has been suddenly arrested.

Allusion has been already made to the cases in which this variety of asphyxia has presented itself,—namely as a punishment in Turkey, and as a means of judicial compulsion, where a witness has persisted in remaining wilfully mute. Occasionally, too, it has happened, that this mode of taking away life has been adopted criminally with the infirm, as in some of those infamous examples of turpitude, which excited so much horror and alarm, in the British metropolis, a few years ago. In these cases of refinement of cruelty, after the victim had been "hocused,"—as it was termed in the slang vocabulary,—by stupifying him with opium in some form, the hand was pressed upon the mouth so as to prevent the entrance of air, whilst the expansion of the chest was prevented by sitting upon the body. In this way, death was as speedy as if a ligature had been passed around the neck, or the individual had been thrown into an irrespirable medium. A case is described, in which asphyxia was nearly induced in a pugilist, by taking the cast of his body in one piece. As soon as the plaster began to set, he felt deprived of the power of respiration; and to add to his misfortune, was cut off from the means of expressing his distress. His situation was, however, perceived in time to save his life. A similar accident happened to an illustrious individual in this country, (President Jefferson,) when the artist Browere was taking a cast of him. Mr. Jefferson informed the author, that he was in imminent danger of suffocation, and the family were so seriously alarmed that the plaster had to be broken off.

b. *Asphyxia from insufficient supply or total absence of oxygen.*

Of this variety there are many examples. It has been before remarked, that extremely rarefied air, and various gases, which are not of themselves *positively* deleterious, may become *negatively* so;—or, in other words, they may destroy, not in consequence of their being possessed of any noxious property, but because they do not furnish the oxygen, which is indispensable to hæmatosis. Hydrogen and azote are in this category. If an animal be placed in either of these gases, it breathes for a minute perhaps; but the conversion from venous to arterial blood in the lungs being prevented, arrest of the circulation in the radicles of the pulmonary veins occurs, in the same manner as in other cases of complete asphyxia. We can hardly, however, imagine the case, in which asphyxia from exposure to these gases could

happen to man. The same may be said of an extremely rarefied atmosphere. For the purpose of experiment we occasionally place one of the lower animals under the receiver of the air-pump; and rapidly exhaust the air: the effect is here speedy, if the vacuum be suddenly formed, and the pathology of asphyxia, thus induced, is like that of the forms just considered; but if the rarefaction be made more gradually, asphyxia is longer in being produced, and the phenomena are much more equivocal.

In the respiration of animals, the oxygenous portion of the air is more or less consumed, and carbonic acid, of a nearly equal volume, takes its place. In other words, the vital portion of the air is abstracted, and an equal volume of air, which is altogether irrespirable, is added to the azote—which, as we have seen, is itself negatively injurious. Now, if an animal be confined in a restricted quantity of atmospheric air, it can exist so long as there is oxygen enough for due hæmatosis, and so long as the deadly agencies of the carbonic acid and the azote are not powerful enough to destroy. The bad effects of confined air might, therefore, be mainly, if not wholly, ascribed to the presence of an undue quantity of carbonic acid, and to the uncombined azote, left after the disappearance of the oxygen. This, at least, is one view of the matter; but those physiologists, who believe that the air is taken into the pulmonary vessels without decomposition; that its oxygen disappears in the course of the circulation, and that carbonic acid is formed in the system, and merely given off at the lungs,—a view which appears to be most in accordance with observed facts,—would ascribe the phenomena to the deleterious agency of the carbonic acid. Instances have occasionally occurred, where death has been caused in this way,—as in a diving-bell, where the air could not be renewed; but the most melancholy example on record was in the—since celebrated—"Black Hole" at Calcutta, a place of confinement 18 feet by 18, or containing 324 square feet, in which one hundred and forty-six persons were shut up, when Fort William was taken, in 1756, by Surajah Dowla, Nabob of Bengal. The room allowed to each person a space of 26½ inches by 12 inches, which was just sufficient to hold them without pressing violently on each other. To this dungeon there was but one small grated window, and the weather being very sultry, the air within could neither circulate nor be changed. In less than an hour, many of the prisoners were attacked with extreme difficulty of breathing; several were delirious, and the place was filled with incoherent ravings, in which the cry for water was predominant. This was handed to them by the sentinels, without the effect of allaying the thirst. In less than four hours, many were suffocated, or died in violent delirium. In an hour more, the survivors, except those at the grate, were frantic and outrageous. At length, most of them became insensible; and, eleven hours from the time they were imprisoned, of the *one hundred and forty-six* that entered, *twenty-three* only came out alive, and these were in a highly putrid fever,—from which, however, by fresh air, and proper attention, they gradually recovered. A similar instance happened in Lon-

don, in 1742. Twenty persons were forced into a part of St. Martin's round-house, called "the Hole," during the night, and several died.

In these, and in all similar cases, the lethiferous influence is doubtless of a compound character; being dependent both upon diminution of oxygen, and the presence of uncombined azote, and of an unusual quantity of carbonic acid. This acid, given off in respiration, is heavier than atmospheric air, and consequently accumulates near the ground, where ventilation is impracticable or neglected, and it can thus be readily understood, that where the only aperture into the chamber is by a roof, or by a window high above the ground, the lower strata of air may become irrespirable for some time before the upper.

c. *Asphyxia by irrespirable gases.*

The gases which produce death by occasioning a spasmodic closure of the glottis, or which are *irrespirable*, are not many. They are chiefly carbonic acid, ammoniacal gas, chlorohydric acid gas, deutoxide of azote, nitrous acid gas, and chlorine. It has been before observed, that different writers have classed under this head, oxygen, protoxide of azote, carburetted hydrogen, carbonic oxide, sulphuretted hydrogen, and arsenuretted hydrogen; but these gases give rise to no symptoms resembling asphyxia. They are positively deleterious, and act upon the frame as *poisons*, under which head they are considered. A similar remark might, indeed, be extended to the gases enumerated as producing asphyxia by spasmodic closure of the glottis, when their strength is reduced below a certain point. Above this, contraction of the muscles that close the glottis is produced, as soon as the gases come in contact with them; but if sufficiently diluted, they may pass into the lungs, and exert upon those organs, and through them on the organism, the peculiar effects which they are capable of inducing. Thus, carbonic acid may cause symptoms of narcotism, whilst ammoniacal gas, chlorohydric acid gas, the deutoxide of azote, nitrous acid gas, and chlorine, may produce violent irritation, and inflammation of the air-passages. It is, however, in their relations to asphyxia, that they have to be considered at present.

Carbonic acid gas is by no means an uncommon cause of asphyxia, and it has not unfrequently proved fatal more slowly by the poisonous narcosis which it induces. It has been found, that air is still irrespirable, when it contains three-fifths of its volume of this gas. Carbonic acid accumulates wherever combustion is going on; but it is the accumulation from brasiers of charcoal, where ventilation is impeded, that has been most lethiferous. The public journals contain accounts of many persons who have perished during the night, from this cause; and it was the method adopted by the younger Berthollet to rid himself of a disagreeable existence, in which he succeeded. In crowded apartments, artificially, heated and well-lighted, inconvenience—such as hurried respiration and circulation, giddiness, &c.—are not unfrequently experienced from the presence of this gas, and allusion has already been made to its being concerned in the fatal affair of the Black Hole. It is the fixed air given off during the vinous fermentation; and, in the large vats of extensive ale and porter breweries, suf-

ficient of the gas is often contained at the bottom to destroy those who may venture down. It is usual to pass a lighted candle to the bottom, and if it continue to burn, the descent may be made with safety,—carbonic acid not supporting combustion. In like manner, it is met with in deep wells, and the same plan is adopted to discover, whether the air will allow of combustion and respiration; but many a labourer has fallen a victim to his want of attention to this precautionary measure. This air likewise constitutes the *choke-damp* of the coal mines, in contradistinction to the *fire-damp*, which consists of carburetted hydrogen. It issues in some volcanic regions in great quantities, from fissures in the rocks, and is found in caverns, as at Pyrmont in Westphalia, and in the celebrated Grotto del Cane at Naples—so called in consequence of the number of dogs that are asphyxied in it. Carbonic acid is also extricated in considerable quantity in limekilns, by the agency of heat, which drives it off from the limestone or carbonate of lime,—and the public prints have detailed many cases in which life has been lost, owing to the wayworn traveller having lain down to rest in the warm but destructive atmosphere around one of these furnaces. Lastly.—Plants evolve carbonic acid in the night, which renders the air of confined apartments unwholesome, and, in some cases, induces asphyxia. An instance of this kind was related in the public prints. A gentleman, having frequently had his pinery robbed, the gardener determined to sit up and watch. He accordingly posted himself with a loaded fowling-piece in the green-house, where, it is presumed, he fell asleep, and in the morning was found dead upon the ground, with every appearance of suffocation, supposed to have been occasioned by the disengagement of *mephitic gas* from the plants during the night.

Carbonic acid cannot be breathed in a pure state, or even, as we have seen, when diluted with two-fifths of its bulk of atmospheric air. It occasions an immediate spasmodic closure of the glottis, which cannot be overcome by the strongest efforts,—preceded by painful irritation of the glottis and the upper parts of the throat. When, therefore, a person descends into a brewer's vat, a foul well, &c., in which the gas is in a concentrated state, he dies as speedily from suffocation as when a ligature is tied round the neck so as to completely shut off the entrance of air into the lungs. Air, however, which contains a much smaller quantity of this gas, is unfit for prolonged existence. Experiments have shown, that animals perished in about three minutes, when plunged into an atmosphere containing about one-fifth of its volume of carbonic acid. But in order that asphyxia may ensue, it is not necessary that the air of a room, in which charcoal is burning, should be as strongly impregnated as this. There is an obvious difference between a mixture of free carbonic acid and air, and a mixture containing carbonic acid actually produced at the expense of the oxygen of the air. If only one-fourth of the oxygen be removed by combustion, it will contaminate the air with one-twentieth of carbonic acid, and, according to MM. Varin and Devergie, will render it asphyxiating.

With regard to the discrimination of asphyxia produced by the inhalation of carbonic acid, nothing can guide us except the history of the event, which may be deduced from the surrounding circumstances,

—not from any intrinsic evidences. Pathological anatomy, independently of circumstantial evidence, does not indicate any phenomena, which distinctly show, that death has resulted from this variety of asphyxia rather than from any other.

Treatment.—In the treatment of asphyxia from the respiration of carbonic acid, the first important procedure is to withdraw the patient from the deleterious atmosphere, and strip him of his clothes, in order that the air may come freely in contact with his skin. He must then be exposed to cool air, and cold water be thrown upon his face, until the respiratory movements re-appear. The reasons for this plan of management have been given previously. Friction over the chest must also be employed, and ammonia may be held to the nostrils, so as to stimulate the oppressed energies. These are the most important steps, but, in addition, insufflation has been advised to remove the noxious gas from the lungs, and to re-excite respiration; and galvano-puncture, in the mode recommended by Leroy d'Etiolles, for stimulating the diaphragm to contraction. It has been conceived, too, that the insufflation of oxygen might be serviceable; and, by some, bloodletting has been employed; but it is not easy to discover the rationale of the action of these agents. The judgment of the practitioner must suggest to him, whether these or other means, adapted to particular emergencies, may be indicated.

Ammoniacal gas, as well as *muriatic acid gas*, *deutoxide of azote*, *nitrous acid gas*, and *chlorine*—when in a state of concentration—are so acrid, that, when inhaled, the most violent irritation of the air-passages is induced. It has generally been conceived, that they prove fatal by occasioning spasmodic closure of the glottis; but, from some experiments, it would seem, that certain of them pass the rima glottidis in sufficient quantity to produce phenomena, which are apparent on dissection. In experiments, which Mr. Broughton made on the effects of chlorine on mice, he found, that they fell dead in less than thirty seconds, and, on opening them, the lungs were tinged with the yellow colour of the gas, and the peculiar odour of chlorine was perceptible throughout their structure. Still, it is probable, that death arises from asphyxia,—not from the poisonous influence of the gas, the effects of which could scarcely be exhibited in so short a space as thirty seconds. The smell of these agents will enable us to judge—in the absence of any history of the case—as to the cause of the asphyxia.

The **Treatment** is similar to that for asphyxia by carbonic acid gas; and, in addition, insufflation with sulphuretted hydrogen gas—largely diluted with common air—may be had recourse to advantageously.

As these gases are extremely irritating, there may be a greater necessity for the employment of bloodletting in asphyxia induced by them.

d. *Asphyxia from mechanical obstacles to the entrance of air into the lungs.*

The most interesting varieties of asphyxia are those that are owing to some mechanical cause preventing the entrance of air into the lungs. Some of these we shall consider in detail.

1. *Asphyxia by submersion* or *drowning*.—This is perhaps the most common, and one of the most interesting in the phenomena which it presents. It differs according as the submersion is complete from the first, or the person has risen again and again to the surface. In the former case, we should expect the *post mortem* appearances to be unequivocal. When a person falls into the water, and remains beneath the surface, an effort is made to inspire; but this is impracticable, in consequence of the medium being irrespirable. Water is, however, drawn in, but as soon as the fluid reaches the glottis, the muscles which close it contract spasmodically; little or no water can enter, and death takes place with the same phenomena as present themselves in strangulation. These, as has been before shown, are,—accumulation of blood in the pulmonary artery and right side of the heart, owing to the non-conversion of venous into arterial blood, and more or less vacuity in the pulmonary veins, and left side of the heart.

It is an important question of forensic medicine,—whether there be any intrinsic appearances about *the found drowned*, which can enable us—in the absence of all history of the case—to pronounce definitively, that death has taken place by drowning. It has often been affirmed, that the presence of water, or, at all events, of frothy mucus, in the bronchial tubes, is characteristic of this variety of asphyxia. But dissidence has existed on this point amongst observers. At one time, the entrance of water into the bronchia was considered to be the essential cause of death, but it is now sufficiently established, both by experiments on animals, and by observation of the bodies of the drowned, that but little water is to be looked for;—generally, indeed, there is none; but there may be a small quantity of frothy mucus, totally insufficient, however, to account for death. By many, water has never been met with in the air-tubes: and several observers assert, that, in their examination of drowned persons, they have neither found water nor froth, although in other cases, some of these observers have met with both one and the other. Louis instituted several experiments with the view of testing this matter. On immersing animals in coloured liquids, he discovered the liquids in the trachea, and sometimes even in the last bronchial ramifications. His experiments were repeated by Goodwyn, both for the purpose of proving that water positively enters the trachea, and of dispelling an idea, which had been entertained, that the frothy mucus is nothing more than a secretion from the bronchial tubes, owing to extreme engorgement of the pulmonary artery, during the last struggles of the individual. Three animals were immersed in mercury, and after death an appreciable quantity of the metal was found in the air-passages. Experiments by others have led to similar results.

Admitting, then, that a small quantity of water may enter the bronchial tubes, it can be readily understood, that if the individual were to rise to the surface, and attempt to breathe, the inspired air, becoming mixed with the water and mucus of the bronchial tubes, might communicate the characters assigned to this frothy mucus; but it is not quite so easy to understand that any frothy mucus or liquid should be met with in the drowned unless under these condi-

tions. If the individual, after immersion, took in any fluid and remained beneath the surface, or, in other words, did not inspire afterwards, it could scarcely be frothy. This would appear to be the view embraced by many. Orfila is of opinion, that a greater or less quantity of water is generally drawn in during the agony of drowning, and that the existence of froth in the bronchia depends, in a great measure, on the circumstance of the animal's having risen to the surface, and respired air once or twice previous to its final submersion. It need scarcely be added, that whenever froth is met with in the air-passages, it is a proof that the individual was immersed alive,—respiration being indispensable to mix the air with the liquid. The fact, however, of water being met with in the tubes is not a sufficient proof that the person came to his death by drowning. It has been affirmed by Drs. E. J. Coxe and Evers, that if cats be first strangled, and then thrown into water, and suffered to remain there for 12 or 14 minutes, no water will be found in the lungs, except when the abdomen is compressed. In the latter case, the air and mucus being driven from the lungs, the liquid will be able to enter. Others, however, as MM. Orfila and Piorry, have deduced, from their experiments, that in the case of dogs, killed by strangulation, and immersed in water a short time after death, water constantly enters the trachea, and may pass even to the last bronchial ramification, if the animal be kept in a vertical position, with the head upwards,—in other words, as if it had died from drowning. Hence it may be inferred, that the entrance of water into the air-passages is not *necessarily* a vital act. Its presence in the trachea, bronchia, and even in the ultimate subdivisions of the bronchial tubes, would not be a certain sign that the person was living at the time of immersion, even if it should be shown that the liquid was of the same nature as that in which he was found drowned. Still, as has been remarked by M. Devergie, this conclusion is not entirely rigorous, unless we infer that the same results occur on man as on dogs.

Again.—It has been affirmed, that the presence of the frothy mucus is not of itself positive evidence of death from submersion, and that it has been observed in other kinds of death. Orfila says, it is not necessary that water should enter the trachea, in order that this frothy fluid should be found: and that the tracheæ of those who have been hanged always contain some of it. The first of these assertions has been confirmed by daily observation; but M. Devergie—although he does not deny the latter—asserts that he has opened the bodies of thirteen individuals who had been hanged, and that in none did he meet with frothy mucus in the trachea. He suggests, moreover, that it is important to have correct ideas respecting the nature of this froth, in order that it may not be confounded with frothy sputa. The froth of the drowned, he says, is commonly white, with very minute and numerous bubbles of air, constituting a foam (*mousse*) rather than a froth (*écume*). It never adheres to the trachea by the mucus, but is applied immediately to the tube. The same slightly viscid water, of which it is formed, attaches it to the trachea: all the bubbles that constitute it have a very fine aqueous envelope; they are readily

divisible, and often, when the trachea is opened, the greater part subside like soap-bubbles;—whence he concludes, that the frothy water of the drowned has but little similitude to the sputa either of pneumonia or of catarrh, and that attentive observation will prevent them from being confounded.

From all, then, that has been said, it is manifest, that although our knowledge on this matter needs some of that certainty, which is so desirable, the presence of frothy water, or of frothy mucus, does not perhaps afford us any unquestionable evidence that death has taken place from drowning rather than from any other form of asphyxia. One observer, M. Devergie, is of opinion, that the strongest of the presumptive signs of drowning is the existence of the non-mucous froth or foam on the internal membrane of the trachea—itself in a sound state.

Again.—It was at one time thought, that the stomach would be found largely distended with fluid in cases of death from drowning; but this also is erroneous. Perhaps, in all cases, some fluid will be swallowed, whilst the power of deglutition remains; but the convulsive action, induced in the muscles of the throat, will generally prevent much from passing. After death, it does not make its way into the stomach. The presence, therefore, of the fluid of immersion in that organ would be evidence, that the person had been thrown in alive; but the evidence loses much of its value, from the difficulty there must always be in establishing the identity between the fluid in the stomach, and that into which the body has been cast.

All these are interesting topics of medico-legal inquiry.

A fluid state of the blood has been considered, by almost all writers on this subject, as an evidence of death from drowning. It would be a singular circumstance were this the fact;—unaccountable, indeed, unless we were to consider, that the fluid of immersion were to penetrate the tissues to mix with one of its solutions; and we know the avidity with which water will penetrate animal membranes to accomplish this. In canvassing this point, M. Devergie states properly, that the existence of coagula in the vessels of the drowned is very uncommon, and that the fluidity of the blood is such, that it flows like water,—but, he judiciously adds, this fluidity ought to be common in cases of sudden death; and he says, that he has found it so in a number of persons, who had destroyed themselves otherwise than by submersion. Such, also, has been the result of the observation of the author on this subject.

Of the general impracticability of resuscitation in cases of asphyxia by drowning—where the causes have been fully and effectively applied—even a few minutes after the cessation of respiration, mention has already been made, when treating of asphyxia in general. Allusion was also made to fabulous narrations of restoration after a long immersion. It is but too true, however, that an immersion of a few minutes only will often seal the fate of the sufferer. It has been asserted, that if the submersion have not exceeded five minutes, and no blow against a stone, or other violence, have occurred to complicate the effects, the efforts at resuscitation, if properly conducted, will gene-

rally be successful. After a quarter of an hour, recovery is not very common; after twenty minutes, or half an hour, it may be considered hopeless. The longest period recorded in the Reports of the Royal Humane Society is three quarters of an hour; and from the first report of the establishment for the recovery of drowned persons in Paris, it would appear, that out of twenty-three cases restored to life, one had been three quarters of an hour under water; four, half an hour; and three, a quarter of an hour; the rest for a much shorter time. Mr. Erichsen, however, in an able paper on asphyxia, states, on the authority of the present surgeon of the Royal Humane Society, that no cases have been saved, which have been more than *four consecutive minutes* under water.

According to M. Devergie, of one hundred individuals who fall into water, or are exposed to the chances of drowning, the following may be taken as the ratio of causes of death. It need scarcely, however, be said, that the assumed ratio can be regarded only as an approximation.

Asphyxia, pure, . . .	25·0		
Asphyxia and Syncope and Cerebral Congestion,	62·5	Asphyxia, . . .	87·5
Syncope, Apoplexy, and Concussion, ...			12·5
			100·5

It must be borne in mind, however, that an individual, who falls into water in a state of syncope may be submersed for a much longer period, and be longer capable of restoration, than if he fell into the water in full activity. To this variety of asphyxia, the epithet "*syncopal*" has been applied. The same may be said of one, who receives a powerful cerebral concusssion, prior to, or at the time of, immersion. He is, probably, in the same condition—so far as his vital functions are concerned—as if he were in a state of syncope. The cases, which we see related, of good swimmers being drowned, are often, probably, of this last class. They are struck by the wave, stunned, and rendered incapable of exertion. Perhaps, the safest rule is to attempt resuscitation, unless the signs which characterize death are present;—according to some, unless putrefaction, or cadaveric rigidity, has supervened; but the humane practitioner requires no guide of this sort. He must judge according to his best powers of discrimination, whether the case be one of asphyxia, or of permanent privation of vitality, and, if any doubt remain on his mind, his efforts must be continued until the doubt is removed. Although in his various experiments on cases of asphyxia, in which the heart's action had completely ceased, Mr. Erichsen has never, in any one instance, been able, by inflation of atmospheric air, to restore the contractions of the ventricles if they have once fairly ceased, notwithstanding that the blood in the pulmonary veins and left auricle became florid in a few minutes, he very properly observes, that some attempt at resuscitation should be made even in the most unpromising cases, and suggests that pure oxygen should be used instead of atmospheric air.

Treatment.—As regards the treatment of this form of asphyxia, much need not be said, in consequence of the immediate application

which the remarks made on the general treatment of asphyxia have to this variety. The rules to be adopted may be summarily expressed as follows:—

When the body is taken from the water, the mouth and nostrils should be cleansed, and if frothy mucus exists in the fauces it may be removed by the finger enveloped in a handkerchief. The wet clothes should be removed; the body be wiped dry, and be wrapped in a dry blanket; in this way it can be taken to the nearest habitation on a board, or in a cart. When the body has been conveyed to a room, admitting of a good fire, if the water has been colder than the medium temperature of the climate, it may be stripped, placed upon a sofa, table, or on a board supported on chairs, before the fire, at such a distance, that the radiant heat does not act too powerfully upon it, care being taken that the air of the apartment is not above 75° or 80°. A greater degree of heat than this is noxious, for reasons before mentioned; and it has been properly observed, that great caution should be used in the application of an elevated temperature to even a part of the body, excepting to the extremities—and they ought not, perhaps, to be excepted—lest the vital power of some important organ should be thereby enfeebled. Such is the course, as regards the application of warmth to the body, most commonly pursued; yet, as previously shown, it has been a matter of question with some, whether the temperature of the body should not be depressed even when that of the atmosphere is low, until respiration has been restored by insufflation. Whatever doubts may exist on this point, there can be none, that any undue elevation of temperature is positively injurious, and that temperature, as Dr. Kay has observed, must be regarded as exerting chiefly a *conservative* influence.

As soon as the body has been placed in the favourable circumstances mentioned, attempts must be made to re-excite respiration, during which the head and chest should be kept raised, and the nostrils and mouth cleansed and kept open; and from what has been before said, the rationale of the following recommendations will be obvious. Let the individual be so exposed, that the atmosphere can act on the body, employ friction, and artificial respiration, according to the plans previously advised, by means of the bandage, and the instrument of M. Leroy or any other at hand, with the precautions that have been pointed out, lest serious mischief be done to the delicate fabric of the lungs. Whilst artificial respiration is carried on, and especially if there be signs of returning animation, the warmth of the patient may be somewhat increased, and bottles of warm water, or warm bricks, or warm flannels, be applied to the feet, knees, armpits, pit of the stomach, and along the spine. The warmth of a healthy person lying by the body is said, in the Report of the Royal Humane Society of London, to have been found, in some cases of adults, but particularly of children, very efficacious. In the same report it is affirmed, that the warm bath, where it can be procured, is preferable to all other means of communicating heat; but the obvious objection to it is, that free exposure to the air is prevented, and the experiments of M. Edwards have established, that water exerts an injurious influence on the nervous and muscular systems

As respects the use of stimulants, bloodletting, and other agents—often had recourse to in this and other forms of asphyxia,—what has been already observed, when touching on the treatment of asphyxia in general, is sufficient, and the same may be said of the means that are necessary after recovery.

It need scarcely be remarked, that the absurd practice of hanging up the drowned by the heels when first taken out of the water, and of rolling them on casks, ought to be universally reprobated. They were introduced at a period when death from drowning was supposed to be owing to the entrance of water into the chest and abdomen. If, in the language of the motto adopted by the Royal Humane Society of London, "*lateat scintillula forsan*,"—the feeble spark could scarcely fail to be extinguished by such treatment.

2. *Asphyxia from hanging and strangling.*—The phenomena of death from hanging and strangling are identical, so far as regards the intrinsic evidences. The extrinsic differ somewhat, in consequence of the situation of the cord, which in the latter cases is horizontal; in the former more vertical. It can be understood, too, that in the former there may be dislocation of the cervical vertebræ, whilst in the latter this is not to be expected; but more mischief may be observable in the rings of the trachea, owing to the violence with which the rope has been tightened with the view of rendering death certain; for strangulation is *primâ facie* evidence of homicide; hanging, of suicide,—it not being a very easy matter to hang a person against his will. Occasionally, too, strangulation has been effected by putting a stone or a coal in a handkerchief, and tightening it so that the coal may press upon and obstruct the windpipe; and cases have occurred of manual strangulation, the evidences of which have been apparent in the ecchymosis produced wherever the points of the fingers have pressed.

It is obvious, that the intrinsic phenomena must differ in these cases, according as the ligature is effectually or imperfectly applied; and, again, a difference may exist as regards the *ratio moriendi*,—whether, for example, death has begun in the lungs, or whether, owing to the dislocation of the vertebræ and consequent injury to the spinal marrow, the organs of innervation have been the first to be deprived of vitality. Now, as injury to the spinal marrow could not be easily induced in death by strangulation, this must be esteemed as the more simple form of the two. Of old, the idea generally entertained was, that death in strangulation is caused by the cord pressing on the jugular veins, and thus interrupting the return of blood from the encephalon, whilst its transmission to the brain by the vertebral arteries is uninterrupted. Engorgement of the cerebral vessels consequently supervenes, and apoplexy. The striking objections to this view are,—that these very vessels may be tied without producing fatal apoplexy, or apoplexy at all. Even the vertebral arteries have been tied, along with the jugulars and carotids on animals,—and yet they have survived the operation. In some experiments, in which Dr. Kay included both the carotid and vertebral arteries in ligatures, one or two of the animals recovered, although they were exceedingly weak for some time after the operation. More recent experiments, by Sir Astley

Cooper, seem to establish, that the functions of the brain are more under the influence of the vertebrals than of the carotids; and that in certain animals—as the rabbit—these functions are instantaneously suspended, when the circulation is simultaneously arrested in both one and the other. Again;—Dr. Kellie tied the common jugular and the recurrent veins low down in the neck on two dogs, one of which appeared to suffer no inconvenience; the other, although rather dull and heavy for two days, speedily recovered.

Another strong objection to the view, that death is owing to hyperæmia of the encephalic vessels, is presented by the well-known experiment of Dr. Monro, Sen., who suspended a dog after having made an opening into its trachea below the place where the cord encircled the animal's neck. Through this aperture, the dog breathed freely during the period of suspension, which was three quarters of an hour. He was then cut down, and did not appear to have sustained any serious injury. When, however, the cord was placed below the orifice, and the suspension was renewed, he soon died. The works on medical jurisprudence refer to cases, in which attempts have been made to save the lives of criminals, by making an opening into the trachea. A well-known case of this kind is that of Gordon, who, at the commencement of the last century, was sentenced to be hanged for highway robbery. He had become very rich by his avocation, and offered a large bribe to induce a young surgeon to attempt to defraud the law of its victim. An incision was made in his neck, and a tube was introduced through it into the trachea, in such a manner, that respiration might go on, if the upper part of the neck were constricted by the cord. The man was, however, very heavy, and it was considered that other accidents, besides the mere interruption of respiration, were produced by the fall; for when the body had been suspended the accustomed time, and was cut down, and handed over to the friends, the surgeon drew blood from the jugular vein, and used the utmost exertion to resuscitate him, but in vain. Some slight evidence of vitality was manifested. Once he opened his eyes and sighed; but this was all.

A surgeon of the Austrian army informed M. Richerand, that he had saved a soldier by practising laryngotomy some hours before the man was suspended.

It certainly cannot be considered as by any means established, that congestion in the encephalon occurs in death from strangulation or hanging. The affirmative view has doubtless been embraced, chiefly in consequence of the marked turgescence of the vessels of the integuments of the head and face. After death from hanging and strangulation, the vessels of the scalp, and of the integuments of the head and neck, are gorged with blood, as well as those of the mucous membranes of the eyes, nostrils, and lips, and not unfrequently blood exudes from the nose and mouth. From these outward signs of turgescence it was inferred, that similar engorgement of the encephalon exists; but, although Morgagni, De Haen, and others, directed their attention for a long time to the subject, they did not discover any signs of engorgement in the brains of such as had died by suspension: and the observations of Mr. Coleman on animals, and of

others, on the bodies of criminals and others who had been hanged, confirm their assertions. Neither is there any appearance of congestion in animals that are killed after a ligature has been put on both the internal jugular veins, or when these vessels have been obliterated by the pressure of tumours. It is proper, however, to remark, that some recent observers affirm, that in a great majority of those who had died from strangulation, they observed signs of apoplexy. Taking all the facts into consideration, we are, perhaps, justified in inferring, that the ligature of the vessels of the neck does not occasion immediate death, and that the constriction by the cord, in suspension and strangulation, does not produce death by engorgement of the vessels of the brain. We have, therefore, to look for another chief cause of death. This is, doubtless, as had been occasionally suggested, and has recently been much insisted upon by Dr. Kay, the interruption of respiration.

The duration of life, in these cases, may be modified, as has been already suggested, by various circumstances,—such as the mode in which the rope is fixed; the height from which the body has to fall, &c. A humane executioner, can expedite death by adding his weight to that of the criminal, so as to luxate the vertebræ of the neck; and Louis found, that the Parisian executioner could generally occasion death without a struggle, by rupturing the ligaments which unite the first and second vertebræ, or the ligament which confines the processus dentatus of the latter, so as to occasion pressure on the spinal cord. It may be laid down as a general rule, that death will supervene in a longer or shorter period, according as the obliteration of the air-passages is more or less complete. Sometimes, as already remarked, the rope may be placed between the lower jaw and the larynx, or in such a position, that a small supply of air may enter the lungs; or unusual rigidity of the cartilages of the larynx may exist, so as to permit air to enter—if not in sufficient quantity to maintain life, at all events to prolong the suffering. This is often the case with those who attempt to destroy themselves. Certain it is, that the action of the heart would appear to continue much longer in hanging than in drowning; and hence, where no injury has been inflicted on the vertebral column by the fall, and no serious lesion induced internally, resuscitation would doubtless be practicable after a much longer interval. In a case of penal hanging, in which a series of heterogeneous experiments were performed, the pulse was perceptible at the wrist for seven minutes; and the pulsations of the heart for twelve. (*Amer. Journ. Med. Sciences*, May, 1840, p. 16.) In that of a man named Green, who was executed at Troy, a few years ago, the pulse is said to have been perceptible at the wrist for seventeen minutes, and a slight tremor of the heart for twenty-four minutes; and in the case of a man named Riggs, executed at Pottsville, in August 1847, the pulse beat 80 in the minute, ten minutes and a half after the drop fell; and twenty minutes after could not be distinguished.

The interruption to respiration must be regarded, then, as the chief cause of death from suspension; yet, as Dr. Kay has observed, the condition of the sanguiferous system is considerably modified in this

form of asphyxia, and the circulation in the brain is somewhat affected, though congestion may not be induced. The sphincters are frequently relaxed; the urine and fæces consequently escape, and there is often erection of the penis with emission of semen. The cause of these different symptoms has been quite a topic of inquiry. Orfila attributes the last symptom to traction of the spinal cord, consequent on the extension of the ligaments of the vertebral articulations; and in support of the opinion he affirms, that erection is a frequent consequence of traumatic affections of the cord: he cites, also, a case in which it occurred in consequence of luxation of the fifth cervical vertebra. Dr. Kay—and we suppose every phrenologist will join with him—is inclined to attribute it to some vascular disturbance of the cerebellum. Emission is, however, by no means as frequent an occurrence as has been supposed. In 77 cases, it was noticed 19 times. It is liable, too, to occur from other causes, such as injuries of the spinal cord by direct violence, as by puncture. The membrane of the urethra has also been found greatly injected. It has been affirmed, by M. Devergie, that some effusion of semen into the urethra almost always takes place, although it may not be apparent externally, and that it is detected by the presence of the peculiar animalcules; but farther observations are necessary.

In some animals, the ligaments of the spine can be readily stretched so as to cause death. Every cook knows, that this is the case with the rabbit,—and we may readily conceive, that death might be produced in this way in man also.

We have before referred to some of the accidents that occasionally complicate asphyxia by suspension;—the injury to the larynx, &c. There have also been cases in which true apoplexy has occurred,—effusion of blood having taken place in the brain; but these appearances present themselves in a few instances only. They are by no means to be looked for in simple cases of asphyxia from hanging or strangulation.

In a manuscript note, furnished by Sir Benjamin Brodie to Dr. Paris, it is stated as the opinion of that distinguished surgeon, that if an animal should recover from the direct consequence of strangulation, it may probably suffer from the effects of the ligature on the nerves afterwards. Sir Benjamin passed a ligature round the trachea of a Guinea-pig, and tied it firmly on the back of the neck with a knot: the animal was uneasy, but nevertheless breathed and moved about: at the end of fifteen minutes, the ligature was removed; but on the following morning the animal died. On dissection, no preternatural appearances were discovered in the brain, but the lungs were dark and turgid with blood, and presented an appearance similar to that which is observed after the division of the pneumogastric nerves. "I do not," says Sir Benjamin, "positively conclude from this experiment, that the animal died from an injury inflicted on the nerves of the eighth pair, but I think that such a conclusion is highly probable, and it becomes an object of inquiry, whether a patient, having recovered from hanging, may not, in some instances, die afterwards from the injury of the par vagum."

Treatment.—With regard to the treatment of asphyxia from suspension—or strangulation—it does not differ much from that which is applicable to asphyxia in general. The chief modification demanded is by the state of engorgement of the venous system of the outward head, produced by the constriction of the cord. The ligature must be removed immediately from the neck; the head and shoulders be elevated; and the body be stripped, and exposed freely to the air, even when the temperature is somewhat low. The application of heat is the more unnecessary in this case, as the body has not been immersed in a cold medium, as in cases of drowning. Artificial respiration must be adopted as soon as possible, with the other agencies and cautions that have been already advised. Bleeding may be useful, to relieve the turgescence of the external vessels,—but only for that purpose. Especial care must be taken not to extinguish the flickering spark of life, yet it need scarcely be observed, that during recovery the abstraction of blood may be practised with great advantage, should symptoms of irregular vascular action about the head seem to indicate its employment.

3. *Asphyxia from smothering.*—Asphyxia from smothering does not differ, in its essential phenomena, from the other varieties. Except in the case of children, it is scarcely known, and even in them it may be regarded as a rare occurrence. Occasionally it occurs to them as an accident, or is perpetrated as a crime. It is possible, too, for an adult, in a state of intoxication or great debility, to get into such a position as to prevent the entrance of air into the air-passages. Death, too, is not unfrequently produced by what is called *overlaying children*, which does not always mean, that they have been smothered by the mother lying upon them. Fatal accidents have happened from the young infant being pressed too closely against the side of the mother during her sleep, so that respiration has been arrested; and it has happened that asphyxia has been caused by the anxious care of the mother to wrap her infant so as to shield it against the inclemency of the weather. Children, again, have been smothered by being folded up in a sort of turn-up bedstead, once much employed—by the poorer classes especially—in a double capacity,—

"A bed by night; a chest of drawers by day."

The same differences may occur in this variety of asphyxia as in those that have been considered,—according as the condition has been induced at once, or as respiration has gone on, though imperfectly, for a time.

Treatment.—As to the treatment, it is precisely that which has been laid down under the former heads, with the exception of the means demanded for their peculiarities. Asphyxia from smothering, may, indeed, be looked upon as the most simple form: to it, therefore, the directions for the management of asphyxia in general are strikingly appropriate.

4. *Asphyxia from tumours, and other morbid conditions.*—Among the causes that give rise to asphyxia, by preventing the entrance of air into the lungs, are enumerated;—obstruction of the air-passages by the entrance of extraneous bodies, by the presence of tumours, or

by any morbid thickening of the lining membrane of the tubes. For an account of the pathological phenomena, which are consequences of morbid actions going on in these parts, we must refer to the chapters that consider such lesions. It need scarcely be said, that if extraneous bodies or morbid conditions shut off the air at once, simple asphyxia is produced; if more slowly, the phenomena—as in other varieties of asphyxia—must be modified by the circumstance; and that the cases will have to be treated—medically or surgically—according to the rules laid down elsewhere. The same may be said of asphyxia produced by wounds in the parietes of the chest, which admit the air freely into the cavities of the pleura, and occasion contraction of the lungs.

By those who have employed the term "*Asphyxia*" in its wide acceptation, many other varieties have been admitted. Thus, one writer, M. Most, enumerates Asphyxia from drinking; A. from poisons; A. from cold; A. from lightning; A. from hemorrhage; A. from violent passions or emotions; A. from concussion or contusion; A. from luxation of the cervical vertebræ, &c.; but, according to the definition of asphyxia, given in this article, their consideration would manifestly be out of place here;—the first link in the chain of morbid phenomena being seated in the functions of innervation or circulation, rather than in that of respiration; yet Dr. Kay, who has so well explained the theory of asphyxia, has indulged in an episode on death from cold, which is as much out of place as would have been one on death from apoplexy, or many of those other varieties that have been admitted by MM. Most, Wagner, and such as allow a more extended acceptation to the term. There is a form of asphyxia, however, which may, with much propriety, be considered in this place,—according to the views which we embrace of its theory and phenomena. This is the *Asphyxia of the new-born infant.*

e. *Asphyxia of the new-born infant—Asphyxia neonatorum.*

It is well known, that during intra-uterine life, no more blood passes through the lungs than is necessary for their nutrition, and that the blood of the fœtus is sent to the placenta, whence it passes back by the umbilical vein; doubtless, after having experienced some changes in the placenta, to better adapt it for the nutrition of the new being. The precise mode in which the nutrition of the fœtus is accomplished has been a topic of discussion amongst physiologists for ages. The facts and arguments appear to us decidedly in favour of the view, which considers, that the human placenta has no direct agency in embryotrophy. It seems, indeed, that all that is necessary —in order that a fœtus shall be developed in utero—is, that there shall be an absorbing surface surrounded by a nutritive substance, which will admit of being absorbed. The cutaneous envelope of the fœtus—monstrous or natural—is such a surface, and the liquor amnii such a fluid; and the matter of the umbilical vesicle, and the jelly of the cord, when these parts exist, and possibly some material derived through the placenta, after it exists, may lend their aid; but the participation of the last organ is questionable. Its function is probably

to admit of the fœtal blood being shown to that circulating in the maternal vessels, in order that some change may be effected in the former, which may better adapt it for serving as the pabulum, whence the secretions from which the fœtal organs have to be elaborated, must be formed. (See the author's *Human Physiology*, 6th edit. vol. ii. p. 528, Philada. 1846.) The placenta, in other words, may be esteemed a respiratory organ of the fœtus; and yet its presence does not appear to be indispensable, as there are many well-authenticated cases of children having undergone intra-uterine development, in the absence of umbilical cord, umbilicus, and placenta. Still, when these parts have once existed, they are necessary for complete fœtal development; and anything, that interferes with the due passage of the blood along the cord, produces asphyxia,—not only by preventing the requisite changes of the blood in the placenta, but by the interference with the circulation, which has to be effected by the umbilical cord and placenta, until the independent circulation is established by pulmonary respiration. We can thus understand, that if the cord come down in such a manner as to be strongly compressed for some time before delivery, asphyxia may be produced. In like manner, when the breech, feet, or knees present, there is danger to the child, unless the delivery be rapid. Occasionally, too, the child is still-born, apparently in consequence of some morbid condition of the organs of innervation. Thus, owing to pressure of the head in its passage through the pelvis, or to some modification in the encephalo-spinal centres, or in the nerves distributed to the respiratory organs, the function of respiration is not established, notwithstanding that the circulation appears to go on well along the cord: the child seems to be in an apoplectic condition.

Asphyxia may persist longer in the new-born child than in the adult, in consequence of the powers of calorification being but imperfectly developed, and there being, in consequence, less need for a highly oxygenized blood for its support.

Treatment.—It has been a question, whether the umbilical cord should be divided in these cases as soon as the child is extruded. In reply to this it may be remarked, that if all circulation have ceased in the cord, there can be no advantage whatever in keeping the connexion between the child and the placenta entire, especially as the union cannot fail to interfere with the due application of such means as may be esteemed necessary. Indeed, where the circulation continues, but is becoming weaker, and the breathing has not commenced, it has been properly doubted, whether if the connexion with the mother interfere with the application of other efficacious means, it should be permitted to continue, when, owing to the placental circulation having become weaker, it seems evident that the application of such means cannot be longer delayed with impunity. Sometimes, when the child is extruded and the placental circulation continues, the stimulus of a smart stroke on the breech will arouse the dormant energies, and it will immediately begin to cry; but if this be insufficient, the infant had better be exposed to a moderately warm temperature,—that is, to the moderate warmth of the fire, so that the air

can come in contact with a large surface of the body. M. Edwards found, that the young of some species of warm-blooded animals, when deprived of air, live longest in a temperature of about 68° Fahrenheit, and this may be taken as a guide to the proper temperature for the still-born infant. Generally, immersion in a warm bath is had recourse to, but the rationale of its action is by no means unequivocal, whilst, as Dr. Kay has observed, it is not necessary to the application of a proper degree of warmth to the body of the child; it prevents the beneficial effects of the atmosphere on the skin; and, moreover, it is found, as we have seen, to exert a depressing influence on the nervous and muscular systems.

In addition to these means, friction with the dry hand, or with stimulating liniments, especially over the region of the chest and stomach, as well as the application of spirits to the nostrils, to rouse the respiratory nerves to action, have been recommended. Should any mucus obstruct the mouth and pharynx, it ought to be removed by means of the finger enveloped in a piece of fine linen, dry or dipped in a solution of common salt. But, after all, these means will often be found unsuccessful, and it becomes necessary to have recourse to artificial respiration. This is, indeed, the great reliance of the practitioner in severe cases, and its salutary influence is frequently marked. Whilst artificial respiration is persisted in, the cord will often be observed to pulsate, and to cease when the operation is suspended. In the still-born fœtus, it is not found practicable to execute artificial respiration by mere pressure on the chest, in the mode recommended for the adult. In one case, Dr. Blundell diligently operated in that manner for fifteen or twenty minutes together, without producing resuscitation, and, on examining the child on the following day, he found that scarcely a particle of air had entered the lungs. Nor can insufflation be readily effected by blowing in at the mouth. The only mode of doing it effectually is by means of a curved canula or some analogous instrument. The author has been in the habit of carrying a tracheal pipe, or tube of silver, closed at the end, and with an aperture near the extremity, to give passage to the air and mucus. The introduction of this instrument into the larynx is by no means difficult. All that is necessary is, to pass the forefinger of the left hand upon the root of the tongue as far as the opening of the larynx, and then to insert the tube, held in the right hand, along the finger as a director. It will readily enter, and by pressing on the neck, it can easily be discovered, whether the instrument be in the trachea or the œsophagus. The lungs may then be inflated by blowing air from the lungs of the practitioner through the tube, and forcing it out again by pressing on the thorax and abdomen, and repeating this five-and-twenty or thirty times in a minute. It has been objected, that the air, sent into the lungs of the fœtus from those of the adult, cannot be as efficacious as pure atmospheric air; but it is to be borne in mind, that the young being does not require such highly oxygenized air as the adult. In inflating, care must be taken, as has been previously inculcated, that the air is not driven in too powerfully. The experiments of M. Leroy d'Etiolles show, that insufflation may be performed with much less risk in the in-

fant than in the adult, because the structure of the lungs is firmer in the former, and consequently there is less danger of rupture or dilatation of the air-cells. If the bellows of M. Leroy be at hand, which they scarcely ever are on such occasions, they may be employed. It has also been proposed, that a small galvanic apparatus, like that recommended by M. Leroy, and before described, might be used with advantage to rouse the diaphragm to contraction. "The acupuncture needles," says Dr. Kay, "might be introduced into the diaphragm, one or two lines on each side of the chest, and two wires, each leading to an opposite pole of the galvanic circle, might be connected with these needles. On completing the galvanic circle, a contraction of the diaphragm would be produced, which might be suspended by removing one wire, for a moment, from its connexion with the battery. The relaxation of the muscle might then be effected by gentle pressure on the abdomen, and this process might be alternately repeated until respiration was established."

Such appears to be the most approved mode of resuscitation in cases of the *Asphyxia neonatorum*. M. Désormeaux, however, complains of his want of success from inflating the lungs, even when assiduously used, and he places his main reliance on external means for exciting the respiratory muscles to contract. For this purpose, he recommends a species of *douche* or ablution with some alcoholic liquor. This the practitioner takes into his mouth, and, having held it there a few seconds, he ejects it forcibly against the anterior paries of the infant's chest. It is rarely necessary, he says, to repeat this more than twice or thrice. M. Velpeau says he has adopted the plan, and with success. It has been also advised, that a cupping-glass should be applied to the nipples of the child, or that they should be sucked by the mouth; but, as M. Désormeaux has remarked, the only use of this can be to excite the action of the muscles. It is utterly impossible, that any dilatation of the chest could be produced by it, as has been believed by many, who were more credulous than judicious.

It is unnecessary to dwell upon the many other expedients that have been occasionally adopted. If the means pointed out should fail, we ought not to expect advantage from such agents as the smoke of linen or burnt paper, or onions or garlic introduced into the rectum, or the application of stimulants to the nose. Their cautious use may be advisable when the spark begins to be ignited, but not before.

When the means are beginning to succeed, the pulsations of the heart and of the cord—if the child be still attached—gradually return; the muscles resume, by degrees, their natural firmness; the skin becomes less pale, and calorification is re-established. Some slight convulsive gasps are made, which become stronger and stronger, and ultimately the child attains sufficient vigour to cry, after which it may be looked upon as safe. This, at least, is a general rule; but every practitioner must have had the mortification to find, that even when he has succeeded so far, unfavourable symptoms have presented themselves, and the child has sunk. M. Velpeau refers to two cases in which he had succeeded in restoring the movements of the heart and lungs

for more than three hours, by means of insufflation and galvanism; yet both infants were subsequently lost.

The same question has been agitated here, as in other cases of asphyxia:—How long ought we to persevere in our efforts at resuscitation? It has been advised, that they should not be relinquished under two or three hours,—but all this must be decided by the good sense of the practitioner. Let him bear in mind that many a child has been thrown aside as dead, which might probably have been saved. A woman, run over by a stage, was carried into St. Thomas's Hospital, London, and died in a few minutes after admission. Dr. Blundell was requested by Mr. Green to assist in the Cæsarean section. In thirteen minutes from the last respiration of the mother, the child was taken out. In fifteen minutes from the same, Dr. Blundell began the artificial respiration, and, during fifteen minutes longer, he continued it. Ultimately the child was completely resuscitated, and, according to Dr. Blundell, if due care had been taken of it, it would probably have been living still. He affirms, also, that a Mr. Tomkins of Yeovil, a gentleman very accurate in his observations, used resuscitants for an hour and five minutes by the watch, before obvious signs of life appeared. The child recovered, and lived for some time afterwards. Still, much must be left to the judgment of the practitioner. Where, from the appearance of the fœtus or other evidences, he has reason to believe, that it has been for some time dead *in utero*, all his endeavours must necessarily be abortive. It is only in cases in which the child has perished in the birth, that means can be effective,—and in such cases all the energetic measures recommended above should be put in force, and not abandoned until hope is lost. Mr. Burns says, that when a child does not breathe soon after it is born, it is not always easy to say whether it be alive, as we have, at this time, no criterion of death except putrefaction; and, therefore, that it behooves us always, unless this mark is present, to use means for preserving it. His remark might be extended to every case of apparent death happening at any age; but there is generally a chain of phenomena, which enables us to pronounce with tolerable certainty before this criterion of death is observable. There can be no doubt, however, that so long as there is any hesitation in the mind of the practitioner, as to whether the child be dead or not, his efforts should be perseveringly continued.

Where there is any reason to believe, that the state of suspended animation is dependent on, or connected with, an apoplectic condition,—as where the respiration is very slow and laborious, and there is evidence of venous engorgement of the head and neck, with pulsation in the cord,—advantage is often derived from permitting a teaspoonful or two of blood to flow.

When the attempts at resuscitation have been successful, the same attention is necessary during recovery—that is, for a day or two afterwards—as in the varieties of asphyxia previously mentioned.

BOOK III.

DISEASES OF THE CIRCULATORY APPARATUS.

CHAPTER I.

MORBID CONDITIONS OF THE BLOOD.

After the follies of the humoral pathology had experienced from pathologists the ridicule which they richly merited, it was for a long time believed, that the fluids are never the seat of disease, and *Solidism* —as it was termed—usurped the place of the former *Humorism*. Daily observation shows, however, that the condition of the solids is materially influenced by that of the blood, which bathes them, and furnishes the pabulum for their support; and, at the present day, the disposition is perhaps greater, amongst pathologists of correct observation and reflection, to look to the blood as the source of many diseases, at one time referred to the solids exclusively, than it has ever been. It is not, however, the old humoral pathology that is revived, but one of a different character, suggested by our better acquaintance with the laws of the organism in health and disease.

Fulness of blood is a condition which enters into the notions of both the professional and the unprofessional; and there can be no question, that a very opposite condition often exists. It is difficult for us, however, to appreciate accurately the effects of difference in quantity of the vital fluid, except when the fulness or deficiency is considerable. The blood, too, can unquestionably be modified in its character, by change of aliment, and by agents, which we are in the habit of administering with this view, as iodine and its various preparations, mercury, &c.; and there can be as little question, that, in various diseases, its character becomes essentially changed, so much so, that its diversities have attracted the attention of numerous observers, within the last few years more especially, and they become a part of the history of individual diseases. Accordingly, in this work, the condition of the blood has already been referred to under numerous heads, and will be still further noticed under diseases that have not yet been considered. It has been properly remarked by M. Andral, that under the triple relation of vital phenomena, intimate structure, and chemical composition, we can draw no definite line of demarcation between the blood and the solids. It is impossible, indeed, for us to conceive, that the state

of the one can be modified, without that of the other experiencing a corresponding mutation; and the more closely we inquire into the pathology of both fluids and solids, the less likely shall we be to admit the claims of either exclusive fluidism or exclusive solidism, and the more satisfied, that the solids and fluids are in mutual dependence.

Whilst the blood is circulating in the vessels, it appears to consist of a fluid portion, to which the name *Liquor Sanguinis* has been given, and of red particles; but when it is removed from the vessel, and no longer subjected to the vital influence, it separates into fibrin and serum; or, in other words, into a solid, and a fluid portion. The *solid*, when washed, and freed from the serum, and red particles, that are mechanically entangled in its substance, constitutes the fibrin; the *fluid* contains water, albumen, oil, animal extractive; and salts—alkaline, earthy and metallic. (See on the whole of this subject, the author's *Human Physiology*, 6th edit. vol. ii. p. 114, Philad. 1846.)

It is obvious, that the blood may vary somewhat in its specific gravity, but the difficulty exists in determining, under such circumstances, whether there be a positive increase or deficiency in the solid portions, or whether the difference may not be owing to a modification in the quantity of the aqueous portion. This may be one reason for the discordance amongst observers, as to the specific gravity of healthy blood; and another is—the difference of temperature at which the specific gravity may have been taken. The mean specific gravity has been estimated, by some, at 1·0527; by others, at 1·0800,—a difference so great as to render it difficult to fix any standard. It is very easy to comprehend, that the specific gravity may be affected by copious loss of blood, especially if fluids be freely allowed. The solid portions are not readily generated; whilst the diminution in the quantity of the circulating fluid increases absorption, and tenuous fluids pass through the coats of the blood-vessels of the stomach and intestines with great facility. The specific gravity of serum affords more precise information. The proper proportion of the saline matters does not raise the specific gravity of serum above that of distilled water, more than five parts in 1000. The excess, beyond this, is owing to the presence of albumen; so that the specific gravity of serum indicates, pretty nearly, the quantity of albumen contained in it; and hence becomes a useful guide in Morbus Brightii. In certain cases of disease, in which albumen is carried rapidly out of the system, as in the renal affection just mentioned, and in dropsies and profuse hemorrhages, the specific gravity of the serum, which, in health, averages 1·027 has been observed as low as 1·013; whilst in other conditions, where the water and even the salts are removed, as in cholera, it has been found as high as 1·041.

The estimation of the quantity of the different constituents of the blood in disease, has attracted the attention of modern pathologists, and especially of MM. Andral and Gavarret, Simon, and MM. Becquerel and Rodier, who have endeavoured to detect the changes that occur in disease in the varying amount of the organic elements of the fluid. The estimates made by these different hematologists varies, however, on account of the different methods pursued by them:—for example,

whilst MM. Andral and Gavarret give the amount of the red corpuscles, M. Simon gives the proportion of hæmatin and globulin, the sum of which can never represent the absolute quantity of red corpuscles. In his method, the nuclei and capsules of the corpuscles are estimated as albumen; in that of Berzelius as fibrin; and in that of MM. Andral and Gavarret as appertaining to the corpuscles.

It may be sufficient to give the method of MM. Andral and Gavarret, referring for that of other observers to the valuable "Animal Chemistry" of M. Simon, published by the Sydenham Society, of London. The blood is received into two six-ounce vessels. The first and fourth quarters are received into one vessel, the second and third into the other. In the one, the blood is permitted to coagulate spontaneously; in the other it is whipped, to obtain the fibrin, which must be carefully washed. When the coagulation has taken place, the clot must be carefully removed from the serum, and the fibrin obtained by whipping one portion, the serum and the clot must be dried. By weighing the dried fibrin we know its amount in the clot. By the weight of the dried serum we appreciate the proportion of water and of solid constituents contained in it. The quantity of water given off from the clot in drying is estimated as serum, and the solid residue due to it is readily estimated. By deducting from the weight of the dried clot, the weights of the fibrin and of the solid residue of the serum contained in the clot, the amount of the corpuscles is obtained. Hence we have:—*first*, the weight of the fibrin; *secondly*, the weight of the corpuscles; *thirdly*, the weight of the solid residue of the serum; and, *lastly*, the weight of the water. (See on the whole of this subject the author's *Human Physiology*, 6th edit., ii. 121, Philad. 1846.)

The proportion of fibrin in the blood varies very materially according to different morbid states. In 1000 parts of blood, it was found, according to MM. Andral and Gavarret, to vary in proportion from 1 to 10; the corpuscles from 185 to 21; the solid matters of the serum from 104 to 57; and the water from 915 to 725. Taking the mean of twelve experiments, it was found, that the crassamentum amounted to 53·307 per cent. The mean proportion of fibrin in healthy blood was found by M. Lecanu, and his results have been adopted by MM. Andral and Gavarret, to be 3 in 1000; according to M. Simon, of Berlin, it is 2·1. It may oscillate, however, in healthy individuals, around this mean, so as to descend to 2·5 or up as high as 3·5. In some persons, indeed, the proportion may be nearly as high as 5; and, in others, nearly as low as 2, without their being indisposed. These cases are, however, rare; and, as M. Andral has remarked, must be looked upon as idiosyncrasies. The mean proportion of corpuscles is 127 in the 1000; but this may vary in health, according to M. Andral, from 140 to 110; in the former case, however, there is an approximation to the plethoric condition. The proportion of solid matters of the serum, which, on the average, may be taken at 8 in the 1000, likewise oscillates above and below the mean, within limits that are compatible with health. Taking the mean of M. Lecanu's analyses of healthy blood as a standard, and contrasting with it the extreme results obtained by MM. Andral and Gavarret in diseased blood, we have the following:—

Lecanu's Analysis.

Water,	790
Solid residue,	210
Fibrin,	3
Organic residue of serum,	72
Inorganic " "	8
Blood-corpuscles,	127

Extreme deviations according to Andral and Gavarret.

Water, from	915·0 to 725·0
Solid residue,	275·0 to 85·0
Fibrin,	10·5 to 0·9
Solid residue of serum,	114·0 to 57·0
Blood-corpuscles,	185·0 to 21·0

It is proper to remark, that the analyses of MM. Becquerel and Rodier exhibit a marked difference in the proportion of the constituents of the blood of the two sexes, in health. So great, indeed, is this, that in order to attain correct conclusions in regard to morbid blood, it is indispensable, they urge, to contrast it with the male or female blood in health. The following are the average analyses of each in health, as given by those observers:

	Males.	Females.
Water,	779·0	791·1
Fibrin,	2·2	2·2
Sum of fatty matters,	1·60	1·62
Serolin,	0·02	0·02
Phosphorized fat,	0·488	0·464
Cholesterin,	0·088	0·090
Saponified fat,	1·004	1·046
Albumen,	69·9	70 05
Blood corpuscles,	141·1	127·2
Extractive matters, and salts,	6·8	7·4
Chloride of sodium,	3·1	3·9
Other soluble salts,	2·5	2·9
Earthy phosphates	0·334	0·354
Iron,	0·566	0·541

The main difference, consequently, between male and female blood in health is in the amount of water and blood-corpuscles. For much valuable information on all this subject, as well as on the differences in the blood according to constitution, temperament, &c., the reader may consult with much advantage the valuable work of M. Simon.

The coagulation of the blood is more speedy in proportion as the circulatory and nervous systems are more feeble in their action. This is the cause, why, during syncope, a coagulum forms around a bleeding vessel, which thus arrests the the hemorrhage, in many cases. In experiments, instituted with the view of testing the influence of reduction of the powers on the coagulation of the blood, it was found, by Mr. Thackrah, that the last portion of the blood drawn coagulated the soonest. On the other hand, when the circulatory and nervous functions are greatly exalted, the blood is slow in coagulating, and this circumstance, it has been presumed, gives occasion to an appearance of the blood, which is of moment to the pathologist. This is the *buffy coat*, which is formed by the upper stratum of fibrin, from which the red corpuscles have subsided. From the researches of M. Mulder, however, it would appear, that the buffy coat does not consist of true

fibrin; but is composed of a binoxide of protein, which is insoluble in boiling water, and a tritoxide, which is soluble. These oxides, Mulder comprehends under the name of *oxyprotein*. The blood, consisting of liquor sanguinis and insoluble red particles, preserves its fluidity long enough to permit the red corpuscles which are of greater specific gravity, to subside through it. At length, the liquor sanguinis separates, by a general coagulation and contraction, into two parts; and this phenomenon takes place uniformly throughout the liquor. That part of it, through which the red particles had time to fall, furnishes a pure fibrin or buffed coat, whilst the portion into which the red corpuscles had descended, furnishes the coloured clot. This, in extreme cases, may be very loose at the bottom, from the great number of red corpuscles collected there, each of which has supplanted its bulk of fibrin, and consequently diminished its firmness in that part.

It would appear, from certain experiments, which have been instituted, that healthy blood is similarly constituted with blood disposed to form a buffy coat,—the main difference being, that the former coagulates more quickly. In some instances, however, as observed by Dr. J. Davy, inflammatory blood does not coagulate more slowly than healthy blood. It would seem, moreover, that the presence of an increased quantity of fibrin in the blood favours the subsidence of the red particles, and hence it has been inferred, that the formation of the buffy coat, may be owing to the blood containing a larger quantity of fibrin, which the blood of inflammation is known to do. The causes, therefore, of the buffy coat in inflamed blood, may be its slow coagulation, and the increased quantity of fibrin. We can thus understand, that in anæmia, in which the proportion of red corpuscles to the fibrin is diminished, we may have the buffy coat; and, accordingly, it is not uncommonly seen in chlorotic cases. This, at least, is the opinion of most pathologists. The experiments, however, of Mr. Gulliver, would lead to the belief, that the more rapid sinking of the corpuscles in buffy blood, results from their greater aggregation,—as had already been maintained by Hermann Hasse,—and along with this increased attraction of the corpuscles, there is probably an increased attraction between the particles of the fibrin, which may account for the firmer clot of the blood of inflammation. These facts, indeed, can be verified in an interesting manner, as regards diagnosis, suggested by Mr. T. Wharton Jones. If a single drop of inflammatory blood be examined in the microscope, the red corpuscles will be seen to coalesce in piles and masses, leaving wide interspaces for the fibrin, corpuscles, and serum, which is not the case in healthy blood. Hence, a single drop of blood may establish the character of the whole mass, and settle the question, where a doubt exists, as to the existence of inflammation.

The cupped form, which inflammatory blood assumes at times, is owing, as remarked by Dr. B. Babington, to inequality of contraction. The upper surface, being freer from intervening red corpuscles, contracts more powerfully than the under, and a concavity of the upper surface is the necessary consequence. When, however, the contraction is weaker, the weight of the subjacent red clot, which forms a

part of the same mass with the upper colourless portion, weighs this down, and keeps it in a horizontal position.

The crassamentum of arterial blood exhibits the buffy coat; but this appearance is rarely seen in blood, which has been extracted by leeches or cupping.

The buffy coat is commonly met with in diseases of high vascular excitement; but it is likewise observed in pregnancy, and, occasionally, in neuropathic affections. It may, however, as remarked above, be absent in diseases that are highly inflammatory; and, perhaps, the explanation of this phenomenon afforded by Dr. Babington is the true one: the circulation may be so overcharged, either actually or relatively, or the nervous power so oppressed, that the requisite degree of propulsive force is not exerted by the heart and arteries, nor is the vital energy, on which slow coagulation depends, imparted to the blood. In such instances, the buffed coat generally appears on a second or third repetition of venesection. The form of the receiving vessel, the degree of motion to which the blood is subjected, and the size of the orifice in the vein, have a great influence. Blood, that would unquestionably exhibit the buffy coat, when suffered to escape from a large orifice, may present no appearance of it whatever, if it trickle down the arm. In a narrow and deep vessel, too, it is better seen than in one that is broad and shallow. The relative frequency of the buffy coat in various diseases is shown by the following table, compiled by Dr. Gross from M. Andral.

Diseases.	No. of cases.	Perfect buffy coat.	Imperfect buffy coat.	Absence of buffy coat.
Acute amygdalitis, . . .	12	9	1	2
Bronchitis, ...	132	35	25	63
Lead colic, ...	10	3		7
Chlorosis, ...	11	7	1	3
Cerebral congestion, . . .	103	14	12	77
Pleuritic effusion, recent and chronic, ...	27	7	9	11
Intermittent fever, . . .	32	5		27
Typhoid fever, ...	187	10	30	147
Cerebral hemorrhage, . .	22	2		20
Hypertrophy of the heart, .	72	11		61
Albuminuria, ...	6			6
Pneumonitis, ...	230	215	15	
Acute rheumatism, . . .	134	125	5	4
Chronic rheumatism, . .	50	11		39
Measles, ...	11			11
Scarlatina, ...	9			9
Pulmonary tubercles, . .	203	140	13	50

The condition of the blood, which gives occasion to the buffy coat, when it occurs in inflammatory diseases, has been considered by M. Piorry an inflammatory state of the fluid itself, and has received the name *Hæmitis*, (Fr.) *Hémite*.

In regard to this pathological state, as well as to the plastic powers of the blood, by which concretions may apparently form in the heart, and become organized during life, we shall have to speak, in dis-

cussing the morbid conditions, in which they are met with. The same may be said of the salts of the blood, to which the attention of pathologists has been directed of late years, especially in the causation of tropical and other fevers, and of malignant cholera. The state of the vital fluid will be found particularly described under these and other affections, where it has been specially noticed, so as to render it unnecessary to anticipate, or repeat the descriptions here.

I. FULNESS OF BLOOD.

Synon. Plethora, P. vera, P. Sanguinea, Polyæmia, Polyehymia sanguinea; *Fr.* Plé-thore, Abondance; *Ger.* Vollblütigkeit, Ueberfluss an Blut.

There can be no question, that a state of the vascular system exists, at times, in which too much blood is formed, and a consequent predisposition is generated to attacks of disease. It has been questioned, however, whether general fulness of blood ought to be regarded as a morbid condition: still, as local congestions or hyperæmiæ are very apt to occur under such a condition, it may be properly considered here. The term *polyæmia*—it may be observed—is used to signify fulness of blood in the general system, whilst *hyperæmia* means a surcharge of that fluid in the capillary system. It is proper, however, to remark, with M. Andral, that an unusual fulness of blood has never been demonstrated, although the phenomena would seem to indicate it.

Diagnosis.—The evidence of fulness of blood may be general or local; and hence certain writers have admitted *general plethora* and *local plethora*;—not that in the latter case, there is such a superabundance of blood in any part of the organism as to constitute congestion or hyperæmia, but, as observed by M. Dubois d'Amiens, that certain organs, by virtue of their texture and functions, first,—and sometimes exclusively,—exhibit the plethoric condition, which, in reality, is general. Amongst the most common phenomena, are—giddiness, rushing of blood to the head, headache, somnolency, fulness of pulse, suffusion of face and eyes, epistaxis, &c.,—the precise phenomena varying according to the predisposition existing at the time in some organ to be attacked with hyperæmia rather than another. Frequently, according to M. Piorry, percussion indicates that the principal reservoirs for the blood, and especially the heart and liver, occupy a larger space than natural; but difficulty must exist in deducing any satisfactory inference from this sign, as the normal extent of dulness can rarely, or never, be known.

An examination of the relative proportion of the constituents of the blood in plethora has shown to M. Andral, that it differs from ordinary blood in the greater quantity of corpuscles, and the much smaller proportion of water. In 31 specimens of blood, taken from plethoric patients, he found the mean quantity of corpuscles to be 141; the minimum 131; and the maximum 154. His researches have led him to the conclusion, that the grand condition of the blood, which favours the production of hemorrhage, is a diminution of the fibrin of the blood compared with the red corpuscles. In plethora, the proportion of corpuscles is greater than in the healthy state, whilst that of the fibrin may be normal, or below the physiological condition. When hemor-

rhage occurs under such circumstances, the quantity of corpuscles diminishes, but not that of the fibrin; hence an equilibrium is induced, and the hemorrhage may not recur, or not until an excess of corpuscles is again produced. In scorbutic cachexia, as is shown hereafter, the quantity of fibrin is diminished, whilst that of the corpuscles may have remained stationary.

Causes.—Certain individuals are disposed to fulness of blood, without the health seeming to suffer; but they are, of course, more liable than others, in whom such plethora is absent, to be attacked with disease. Amongst the exciting causes are, too much nourishment, want of proper exercise, and of the ordinary healthful mental and other excitants. It can be readily understood, too, that the suppression of wonted evacuations may induce the same condition. M. Andral believes that true plethora is more often constitutional than acquired; and it is well known, that it cannot always be induced at will by too abundant nourishment.

Treatment.—In this affection, precautionary measures are all important. If a marked tendency to fulness of blood exhibit itself, the quantity of food should be diminished, and vegetable should be preferred to animal food, as the latter forms a more copious and a richer chyle. Aqueous drinks may likewise be allowed freely. When the evidences of fulness, before mentioned, present themselves, in addition to appropriate restrictions in regard to diet, it may be proper to diminish the amount of blood in the system by bloodletting, by which the ratio of the red globules is diminished; but this should be employed only as a palliative; for if it be repeatedly performed, by adding to the activity of absorption, it cannot fail, ultimately, to augment the evil which it was intended to remove. Where the symptoms are encephalic, the application of cups to the nape of the neck, and the loss of ten or twelve ounces of blood, in this way, often afford essential relief. Cathartics are, in such cases, valuable agents. The sulphate of magnesia, for example, may be administered two or three times a week in such doses as to produce two or three watery evacuations; and exercise on foot should be taken so as to cause slight fatigue, but not so much lassitude as to endanger the supervention of hyperæmia. In this way, the tendency to fulness of blood may often be got rid of.

II. PAUCITY OF BLOOD.

Synon. Anæmia, Anæmosis, Oligæmia, Polyanhæmia, Hypæmia, Anhæmatosis; *Fr.* Anémie; *Ger.* Blutleerheit, Blutmangel.

Although the term *Paucity of Blood* is used here, it is not intended to treat solely of deficiency of that fluid, but to include that condition in which the watery portions largely predominate, or what has been called *Hydroæmia* or *Hydræmia.*

Diagnosis.—The most striking symptom is, the paleness of the countenance and of the integument generally, as well as of the mucous membranes, where they commingle with the skin. At times, however, the vessels of the skin of the face are turgid with blood, and instead of communicating the usual florid hue to the cheeks, or the vivid red observed in ordinary febrile affections, they present the

appearance of a livid and circumscribed flush of a very peculiar character. This was a prominent symptom in a case, which fell under the author's charge in the Philadelphia Hospital: all the functional phenomena were those elsewhere described as constituting "*Splenic cachexia*," of which the anæmic condition of the blood forms an essential part. In these cases, if suffusion of the cheeks exist, and the blood be forced out of the capillaries, it is slow in returning into them. The pulse is usually small, feeble, slow, or, at times, frequent and almost imperceptible, irregular or intermittent. Occasionally, however, after great losses of blood, and especially after reaction supervenes, the impression conveyed to the finger by the pulsations of the artery at the wrist may deceive, and, unless great care be taken in the examination, or the history of the case be known, it may be treated as one of polyæmia rather than of anæmia. Usually, under such circumstances, the pulse is quick, but there is little or no arterial tension; and, when the loss of blood has been very great, it appears shattered, as it were.

Where the oligæmia is to a great degree, the patient can make use of no effort without experiencing a sense of suffocation, and palpitations, which compel him to stop; he complains, too, constantly of disagreeable beatings in the chest, and in the vessels of the neck and head, and frequently falls into a state of syncope, when he remains for any length of time in the erect attitude. At times, even rising from the horizontal to the vertical position occasions fainting; and, if the arms be raised above the head, the pulsations at the wrist become imperceptible. The nervous system appears to be impressible in proportion to the anæmia, so that irregularities in the circulation are apt to take place under slight sources of excitation. This is strikingly exemplified in the headache, the beating of the carotid and temporal arteries, and the suffusion of face, that rapidly supervene on sudden and copious losses of blood, as in uterine hemorrhage. The phenomenon of the *venous pulse* is, at times, perceptible,—perhaps, owing to the regurgitation of the blood through the tricuspid valves, which impresses the column of blood proceeding to the heart by the vena cava descendens; and, owing to the thin condition of the blood, a rapid and perceptible subsidence of the veins of the neck occurs synchronously with the active dilatation of the ventricles of the heart.

In most cases of anæmia, the encephalic functions are disturbed, and there is vertigo, with tinnitus aurium, and impaired or depraved vision. The gastric functions are equally disordered, as indicated by loss of appetite, or by a capricious condition of the same, with nausea or vomiting: constipation is common, and the urine is clear and limpid. Usually, towards the termination of the disease, or in its progress, there is more or less infiltration of the lower extremities, or dropsical effusion into one or more of the cavities.

When blood is drawn from an anæmic patient it is found to possess a smaller proportion of the crassamentum, and this is loosely cohering; the quantity of serum, on the other hand, is greatly augmented. In certain cases of anæmia, which fell under the author's charge in the summer of 1840, when blood was drawn from the

temples, by means of cups, to relieve the encephalic disorder, there was scarcely any clot, and the blood, as it flowed, appeared to be merely coloured serum. The essential character, however, of the blood of the anæmic is the opposite to that of the plethoric—paucity of globules. In 16 cases of incipient anæmia, Andral found the proportion to be 109; and in 24 cases of confirmed anæmia, 65. That distinguished observer draws attention to different forms of anæmia in connexion with the modifications of composition in the blood. In spontaneous anæmia, slight or considerable, he found the corpuscles alone diminished in quantity; the fibrin and solid matters of the serum possessed their healthy proportion: thus, in 16 cases of slight anæmia, he found the average proportion of fibrin, 3·0: and in 24 cases of confirmed anæmia, 3·3. In the anæmia, also, that follows hemorrhage, the corpuscles alone may have their proportion diminished; but if the hemorrhage should augment, or be renewed, the blood soon begins to lose some of its other principles; and, along with the corpuscles, the fibrin, and the albumen of the serum diminish. In a female, who had suffered from copious metrorrhagia, the blood was found to contain only 21 parts of corpuscles; 1·8 of fibrin; and 61 of solid matters of the serum. The water had arisen to the enormous proportion of 915 parts. In anæmia, induced by appreciable modifications of the organism, the composition of the blood was affected as in spontaneous hemorrhage; thus—the corpuscles alone were found to be diminished, —the fibrin and albumen of the serum remaining the same. This was the case in several pregnant females, whose blood had lost corpuscles without any diminution of its fibrin. M. Andral found the mean proportion of corpuscles in them the same as in cases of slight anæmia. (See Chlorotic Cachexia.)

Owing to the proportion of fibrin to the red corpuscles being increased, the buffy coat is not an uncommon phenomenon in anæmia, and especially in cases of chlorotic cachexia (q. v.); for it has been shown, that whenever there is an increase in the proportion of fibrin to the red corpuscles, and at the same time the coagulation of the blood is not too rapid, the fibrin accumulates at the surface of the blood, and the buff appears.

Whenever a certain diminution takes place in the proportion of the corpuscles, a bellows' sound is heard, when auscultation is practised over the arteries. According to M. Andral, this is connected with impoverishment of the corpuscles, inasmuch as it is not heard when the fibrin alone is diminished in quantity. Accordingly, it is not met with in scurvy, at least until the corpuscles have become affected; nor has it been heard in cases in which the impoverishment of the blood is especially owing to diminution in the quantity of the albumen of the serum. Auscultation over the region of the heart generally indicates, that the sounds are distinct, and sharper than usual. They can, at times, be distinguished over the whole of the thorax, and are occasionally accompanied by the *bruit de soufflet* or "*bellows' sound.*" The impulse communicated to the hand applied over the region of the heart—which, in the early period of the disease, is energetic—commonly, in the progress of the affection, becomes feeble. When the

arteries are examined by the stethoscope, the same sounds are heard as in chlorosis: they are modifications of the bellows' sound. Chlorosis, indeed, belongs to anæmia; and amenorrhœa is not uncommonly attended with the same anæmic condition. The sounds, heard in the arteries, are best observed over the carotids; but they are not continuous.

The different functional phenomena, which are characteristic of anæmia, generally occur in a gradual manner, and it is long before they induce so much disease as to cause death. In the very thin state of the blood that accompanies it, hemorrhages readily occur from parts in which the vessels are but loosely protected by the tissues in which they creep, as from the mucous membranes—the gastro-intestinal especially;—and these hemorrhages greatly hasten the fatal termination, both by the increased exhaustion which they induce, and by their laying the foundation for hydropic or other mischief.

Causes.—Any circumstance that deprives the organism of the blood necessary for the nutrition of the tissues, may be the cause of anæmia. Hence, copious loss of blood, either spontaneously or by art, is a common cause; but, of late years, since a more wise caution has been inculcated in regard to the employment of the lancet, it is much less frequently induced by the efforts of art than formerly. Next to loss of blood, must be placed insufficient nourishment. In the cases before referred to, in which the oligæmic condition of the blood was so marked, the patients had sailed from the West Indies for America, with provisions for two weeks only; and their voyage being one of three weeks, they were compelled to live for the last week almost wholly on water, which, of course, contained scarcely any reparatory materials; the solid portions of the blood were, consequently, appropriated to the uses of the economy, and their places supplied by water only. In like manner, excessive fatigue, want of rest, the respiration of an impure air,—and especially if there be, at the same time, privation of solar light—impair hæmatosis, and give rise to anæmia. The influence of the last agency is considerable. In many mines,—and those of Anzin and Schemnitz, in Hungary, are particularly specified, —the workmen suffer rapidly and fatally from anæmia, hence it has been termed *Maladie des Mineurs;* and in all crowded cities, especially amongst the inhabitants who enjoy but rarely the light of the sun, a paleness (*étiolement*) is produced, which signally distinguishes them from the ruddy inhabitants of the rural districts, and has been termed —in the case of London—*Cachexia Londinensis.* Anæmia is also symptomatic of various diseased conditions. Whenever, indeed, any organic mischief exists, the condition of the blood becomes impoverished, and paleness is the result. The same effect is induced by the depressing passions, but in these cases the anæmia is transient. The paleness of the surface, which is the result of a febrile attack, and especially of the cold stage, does not belong to this affection. It is owing to the recession of the vital fluid from the surface towards the centre, and is removed by the re-establishment of the centrifugal forces.

Pathological Characters.—On the necroscopy of those who have died

anæmic, the tissues of the different organs have been found pale, and the vessels and heart almost exanguious. The heart, too, is often atrophied, and its tissue softened, especially if the disease have been of long duration. The intestinal canal is frequently, also, pale; and the serous cavities and cellular membrane are infiltrated with serous fluid.

Treatment.—In the treatment of anæmia, it is all important to inquire, whether it be idiopathic or symptomatic; and, if the latter, to endeavour to discover the pathological cause, and to remove it. In almost all cases, it is essential to place the patient on nourishing diet; and especially so, where the anæmia has been induced by insufficient nourishment; yet care must be taken, in the very impressible condition of the system, which prevails in these cases, that undue excitement be not induced. It is likewise important, in all cases, that the patient should be placed in a pure air; and this becomes especially necessary, when the anæmia has been induced by the respiration of an impure atmosphere. In such case, and particularly where the patient has resided in a dark situation, there is very frequently, along with the anæmia, a scrofulous or rhachitic condition, which will demand an appropriate management.

The best therapeutical agents are the preparations of iron, and especially the iodide and the sesquioxide or precipitated carbonate. The iodide may be administered in the dose of two or three grains in solution, twice or thrice a day, which may be gradually augmented. So far as the author's experience goes, it is the best form of ferruginous preparation; and such is the opinion of Dr. C. J. B. Williams. By many, the sesquioxide is highly extolled,—commencing with five or ten grain doses, where the patient is much debilitated, and augmenting the dose gradually to one, two, or even three scruples, once or twice a day. The lactate, in the dose of from gr. xij. to xx. in the twenty-four hours and the citrate in the same doses, twice or thrice a day, have been prescribed of late,—the latter frequently by the author. It is an elegant preparation. The neuralgic symptoms are often speedily allayed by the chalybeate treatment, which, as elsewhere remarked, is well adapted for cases of pure neuralgia. The different mineral and vegetable tonics may be given, as well as the sulphate of quinia, but they are of inferior efficacy to the preparations of iron.

To allay the great nervous impressibility which always exists to a greater or less degree in such cases, no remedy affords greater service than the hydrocyanic acid.

℞.—Acid. hydrocyanic. gtt. iv.
Mucilag. acac. f℥iij.
Aquæ camphoræ f℥vj.—M.
Dose, one-fourth part, every six hours.

A full dose of opium, (gr. iiss, in the form of a soft pill, or 25 drops of the black drop,) may be administered to allay the excessive turmoil of the vascular and nervous systems, which occasionally prevails; and the strictest mental and corporeal quietude should be enjoined. Under a careful management of this kind, the blood will gradually become

richer in its constitution, and the phenomena of anæmia will gradually disappear.

There can be no question that as there may be congestion of blood in an organ, so may there be paucity of blood or anæmia. Thus if, from any cause, sufficient blood is not sent to the brain, all the phenomena of syncope result. Pathologically we are acquainted with the appearances of anæmia of the liver, &c.; and the dyspnœa, which is observed in chlorosis, is sometimes referred to a state of anæmia of the lungs. As questions of pathology and therapeutics during life, however, these partial anæmia are not of much interest, inasmuch as they cannot be readily, if at all, appreciated;—dissection alone revealing the condition, and by no means establishing, that the anæmia had not been at times wholly cadaveric.

CHAPTER II.

DISEASES OF THE CIRCULATORY ORGANS.

Although the functional disorders of the organs of the circulation were carefully attended to by the older writers in their connexion with diseases of other parts of the economy, the diseases of the organs themselves were but little known, until of comparatively recent periods, when some distinguished observers,—Lancisi, Valsalva, Bonetus, Morgagni, Sénac, &c.,—directed great attention to them, and laid the foundation for the important advancement, which has taken place in our own time. There is no portion of the economy, which has received, and continues to receive, more of the investigations of the pathologist.

The number of cases, recorded in the reports of the Registrar-General as having died, in England and Wales, of diseases of the heart, or of the organs of circulation, in 1839, was 3788. or about 1·14 per cent. of the whole number of deaths.

The diseases of the organs of circulation may be divided into—1. Those of the heart. 2. Of the arteries. 3. Of the veins. And 4. Of the intermediate or capillary system.

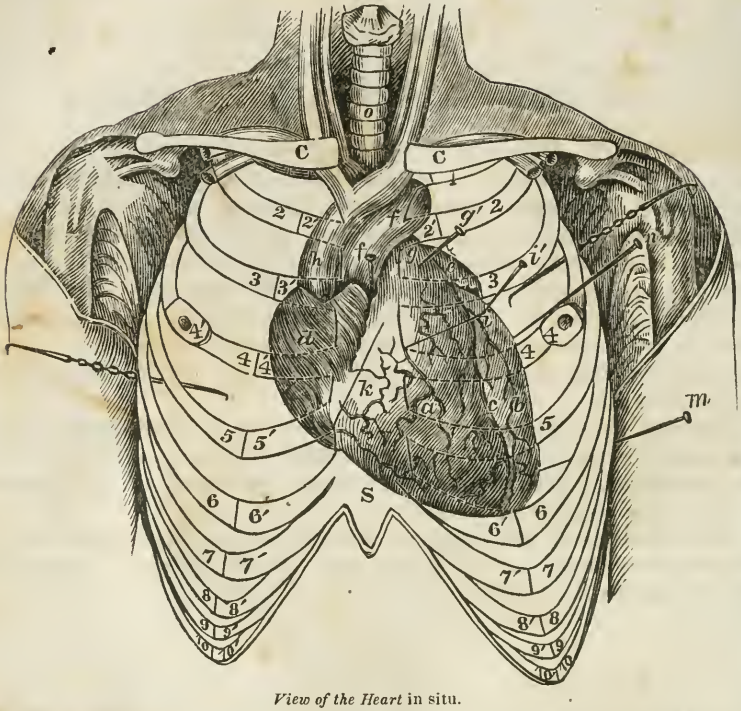
SECTION I.

I. DISEASES OF THE HEART AND ITS MEMBRANES.

Before proceeding to the consideration of the particular diseases of the heart, it will be important to premise briefly some anatomical and physiological considerations relative to that viscus, without an accurate knowledge of which, it will not be easy for us to arrive at any exact pathological deductions.

1. *Position of the heart.*—From accurate examinations, made on the dead body, by Dr. C. W. Pennock, of Philadelphia, the valves of the aorta lie beneath the middle of the sternum and opposite the lower edge of the cartilages of the third rib; the valves of the pulmonary artery are more superficial, and are situate to the left, and about half an inch above. The aorta from its origin curves upwards towards the right, extending between the cartilages of the second and third ribs, slightly beyond the right margin of the sternum. At the lower margin of the second cartilage, the arch of the aorta commences, and inclines to the left, crossing the pulmonary artery where it lies beneath the left second rib, and, ascending as high as the first rib, it turns downwards. The pulmonary artery, from its origin in contact with the sternum, commences at its left margin, where it is joined by the cartilage of the third rib, bulges at the interspace between the second and third cartilages close to the sternum, and

dips beneath the aorta opposite the junction of the second cartilage and sternum.



View of the Heart in situ.

S. Outline of Sternum. C. C. Clavicles. 1, 2, 3, 4, 5, 6, &c. The ribs. 1′, 2′, 3′, 4′, 5′, 6′, &c. Cartilages of the ribs. 4′′. Right and left nipples. *a.* Right ventricle. *b.* Left ventricle. *c.* Septum between the ventricles. *d.* Right auricle. *e.* Left auricle. *f.* The aorta. *f′.* Needle passing through aortic valves. *g.* Pulmonary artery. *g′.* Needle passing through valves of pulmonary artery. *h.* Vena cava descendens. *i.* Line of direction of mitral valve; the dotted portion posterior to the right ventricle. *i′.* Needle passed into the mitral valve at its extreme left. *k.* Line of tricuspid valve. *o.* Trachea.

The right divisions of the heart, being most superficial, form the greater part of the anterior surface: the right auricle reaches from the cartilage of the third rib to that of the sixth; and between the third and fourth, where its breadth is greatest, it extends laterally nearly two inches to the right of the sternum. About one-third of the right ventricle lies beneath the sternum,—the remaining two-thirds being to the left of that bone. The septum between the ventricles coincides with the osseous extremities of the third, fourth, and fifth ribs; and, on the fourth rib, is midway between the left margin of the sternum and the nipple. A small part, perhaps one-fourth, of the left ventricle presents anteriorly; and when the lungs are separated, a portion of the left auricle is visible between the second and third left ribs, two inches from the left margin of the sternum. With the exception of these portions, the whole of the left ventricle and auricle lie posterior to the right ventricle, and the entire left heart, with the exception of a small portion of the base connected with the valves of the aorta, lies on the left of the sternum.

As the heart is movable, the auriculoventricular valves of both

sides necessarily change their relative position in regard to the parietes of the thorax, in every change of posture of the body. When examined in the dead body—the subject being on the back—the regular situation of these valves is as follows:—the tricuspid extends obliquely downwards, from a point in the middle of the sternum immediately below the third rib, to the right edge of the sternum, at the lower margin of the cartilage of the fifth rib. The mitral valve commences beneath the lower margin of the left third rib, near the junction of its cartilage with its bony extremity, (two and a half to three inches to the left of the sternum,) and runs slightly downwards, terminating opposite the left margin of the sternum, where it is joined by the cartilage of the fourth rib.

It is important to bear in mind—in the diagnosis of cardiac disease—that the heart, in the healthy state of the thoracic organs, is uncovered by lung, and in contact with the parietes of the chest, over a space of about two inches in diameter. In this space, there is a very obvious dulness of sound on percussion; but the organ extends from an inch and a half to two inches farther over to the left side, under cover of the lung, where, according to M. Piorry, its existence may be detected by forcible mediate percussion. The vertical extent of dulness is slightly less than the transverse; and the distance of the heart from the top of the sternum is generally from three to three and a half inches, unless when enlargement of the viscus exists, or the diaphragm is thrust upward by disease.

2. *Size of the heart.*—This of course varies in health according to circumstances. It was considered, by Laënnec, to be of a healthy size, when equal to the fist of the individual; but observation shows, that this is wholly inaccurate, and does not apply even to the dead body; for, as remarked by M. Piorry, the appearance and size of the heart vary greatly according to the kind and promptitude of death. In twelve hearts, taken from male and female subjects, between 25 and 40 years of age, and which were, to all appearance, perfectly sound, the average length of the ventricles, including the apex of the heart, was found by Professor Gross of Louisville, to be four inches; of the auricles, one inch and three quarters. The mean circumference, measured around the auriculoventricular groove, was nine inches and a half; the breadth four inches. The thickness of the ventricles varies in different parts of their extent. The thickness of the right, in those cases, was scarcely two lines at the middle, whilst it was nearly two and a half at the base, and about one and a quarter at the apex. In like manner, whilst the left ventricle was seven lines in thickness at the centre, it was only six at the base, and four and a half at the apex. The mean thickness of the right auricle was one line; of the left, a line and a half. The thickness of the interventricular septum was found likewise to vary in different parts of its extent,—being at its maximum in the middle, where it was six lines and a half; and at its minimum at the apex, where it was nearly the sixth of an inch less. The mean thickness of the interarticular partition was a line and a half.

It has been affirmed by an accurate observer, M. Bizot, that the

dimensions of the heart are in a direct ratio with the breadth of the shoulders, and that the organ is always larger—not relatively but absolutely—in persons of middle stature or under, than in those who are remarkable for their height.

3. *Weight of the heart.*—This of course varies also in different individuals, and at different periods of life; so much so, indeed, that but little importance is attached either to the weight or size by some observers. Compared with the weight of the body, it has been estimated by M. Carus as 1 to 160, and by M. Weber as 1 to 150. The mean weight has been variously estimated,—by some, as by M. Cruveilhier, at six or seven ounces; by others, as by M. Bouillaud, and Professor Gross, of Louisville, at from eight to nine ounces. Dr. Clendinning, states, that he carefully weighed nearly four hundred hearts of both sexes, and of all ages above puberty. The result was about nine ounces avoirdupois;—the average weight of the female heart being about an ounce less than that of the male. This, however, is a much smaller average than that obtained by Dr. John Reid, who found the mean weight of the male heart, of 89 weighed, to be eleven ounces and one drachm; and of the female heart, of 53 weighed, to be nine ounces and half a drachm.

4. *Sounds of the heart.*—When the ear or stethoscope is applied to the præcordial region, we hear, first, a dull lengthened sound, which is synchronous with the arterial pulse, and is evidently produced by the contractions of the ventricles. This is instantly succeeded by a sharp, quick sound, like that of the valve of a bellows, or the lapping of a dog. It corresponds to a part of the interval between two arterial pulsations. Between this second sound and the first is a period of repose, which makes up the entire interval between the pulsations. To convey a notion of these sounds, Dr. C. J. B. Williams employs the word *lubb-dup;*—the first word of the compound expressing the protracted first sound; and the latter the short second sound.

The cause of the sounds of the heart has been an interesting subject of inquiry, and has engaged the attention of some of the best modern observers. The view, that the first sound is referable to the systole of the ventricles, and the second to the obstacle presented by the semilunar valves to the return of the blood from the arteries into the heart, is most in accordance with the results of the author's own observation and reflection. That the first sound is synchronous with the contraction of the ventricles, and the second with their dilatation, is scarcely disputed by any; and researches by competent observers, Drs. Pennock and Moore, of Philadelphia, have shown, that the above views are probably correct. These gentlemen found, from their experiments on animals, that the sounds are more distinct when the muscle is thin, and contracts quickly; hence the clear flapping character of the first sound over the right ventricle as compared with that of the left. The first sound, the impulse and the systole of the ventricles were synchronous; and they suggest, that it may be a compound of the sound caused by the contraction of the auricles—which is extremely slight, however—the flapping of the auriculoventricular valves, the rush of blood from the ventricles, and the sound of muscular contrac-

tion, and perhaps the impulse of the heart against the chest. It would seem, from one experiment, that the auriculoventricular valves can have but little agency in the production of the sound. Dr. Billing, however, ascribes the first sound wholly to the tension produced in the shutting of the valve. The second sound, Messrs. Pennock and Moore found to be caused exclusively by the closure of the semilunar valves by the refluent blood. There can be no rational doubt, then, that the first sound is synchronous with the contraction of the ventricles,—the second with their dilatation. The main results of the experiments of these gentlemen accord, indeed, greatly with what the author has entertained and taught on the subject. Still, the matter is open for fresh investigation: especially as M. Cruveilhier, from a case of ectopia cordis carefully examined by him, inferred that the greatest intensity of the first sound is in the same situation as the greatest intensity of the second,—that is, at the origin of the large arteries—or, in other words, that both sounds are seated in the semilunar valves. M. Cruveilhier states it to be, in his opinion, a uniform occurrence for disease of the semilunar valves to modify both sounds—a fact which the author has long noticed. Dr. Carpenter thinks the results of the observations of M. Cruveilhier clearly establish, that the principal causes of the first sound exists at the entrance of the arterial trunks; and it does not appear to him, that any other reason can be assigned for it than the prolonged rush of blood through their orifices, and the throwing back of the semilunar valves, which, in suddenly flapping down again, produce the second sound. (See, on all this subject, the author's *Human Physiology*, 6th edit. ii. 130, Philad. 1846.)

The first sound, heard through the stethoscope applied over the inferior part of the sternum, is clearer and shorter than that which is heard over the left nipple. The sound, heard in the former place, is ascribed to the contraction of the right ventricle; that in the latter situation, to the contraction of the left ventricle. Such has been the view of the author, and it is held by many. On the other hand, it has been doubted, whether, in the natural condition of the parts, the distinction be admissible, when we take into consideration the limited extent of these cavities, their close apposition, and the manner in which the right ventricle lies over, and in front of, the left.

5. *Impulse of the heart.*—In the upright posture, the apex of the heart beats between the fifth and sixth left ribs, about two inches below the nipple, and one inch on its sternal side; but as the heart is fixed only at its base, the position of the apex changes in different postures of the body: and, of course, the heart is liable to displacement by diseases, either of the thorax or abdomen, which forcibly press upon it. In a case of ascites, it has been pressed up so that the impulse was felt, during life, by Dr. Pennock, as high as the third rib,—one inch above the left nipple. In the course of the last winter, the author marked it in a case of saccated ascites between the third and fourth ribs.

During inspiration, the heart is carried a little downwards and backwards, so that, in deep inspiration, it may beat below the sixth rib; and on the other hand, in a forced expiration, the strongest pulsation may be raised to between the fourth and fifth ribs. It will be

readily understood, that as the ribs rise during inspiration, and the chest is expanded, the impulse—in the former case—may be very slight; whilst in the latter, owing to the ribs being brought into contact with more of the heart, the impulse may be perceptible over an extended surface, as high, according to Dr. Williams, as the third rib, and on the lower half of the sternum.

In many diseases of the heart, the impulse may be strong, whilst the pulse at the wrist is feeble; and there is soundness in the opinion of Laënnec, that the pulsations of the heart afford a better index of the degree of danger in a disease, as well as of the appropriateness of depletion, and of the extent to which it may be carried, than those at the wrist. In cases, too, where the pulse at the wrist intermits, the beats of the heart may be uninterrupted. In a case of endopericarditis, which the author watched closely, the pulse exhibited a decided intermission every few beats, yet the heart beat its due number of times. It seemed to the author, that, in this case, the contractility of the aorta was unusually developed by the inflammatory condition of the heart, and that the flow of blood from the ventricle into the aorta was occasionally diminished or wholly impeded.

Uncertainty still rests as to the cause of the heart's impulse against the chest,—whether, for example, it be produced during the contraction or the dilatation of the ventricles. The observations of Drs. Pennock and Moore make the first sound, the impulse, and the ventricular systole synchronous; but all observers do not accord with them.

6. *Rhythm of the heart.*—In the state of health, and when no disturbing moral or physical cause is in action, the rhythm of the heart is as follows:—if we divide the time from the commencement of one first sound to that of its successor, into four periods, the two first periods will be occupied by the first sound, the third by the second, and the fourth by the interval of repose.

The following tabular view of the alterations of the sounds of the heart is given by MM. Barth and Roger.

I. In their Seat, ...	Displacement of the sounds.
II. In their Extent, ...	Sounds circumscribed. Sounds extensive.
III. In their Intensity, ...	Sounds strong. Sounds feeble.
IV. In their Rhythm, 1. Frequency, .	Sounds slower. Sounds accelerated.
2. Order of succession,	Sounds irregular, intermittent.
3. Number of sounds,	A single sound. Three or four sounds.
V. In their Quality (*timbre*) and Character,	Sounds dull. Sounds clear, &c. Sounds of metallic character.

VI. By Abnormous Sounds.

These "abnormous sounds" may be tabulated as follows:

I. Blowing or Bellows' Sounds (*Bruits de Souffle* ou *de Soufflet*),	Blowing sound (*Bruit de Souffle*). Rasp sound (*Bruit de Râpe*). File sound (*Bruit de Lime*). Saw sound (*Bruit de Scie*). Musical sounds, whistling, &c.

II. Friction Sounds (*Bruits de Frottement*).
- Grazing sound (*Bruit de Frôlement*).
- Friction sound (*Bruit de Frottement*).
- New-leather sound (*Bruit de Cuir neuf*).
- Scraping sound (*Bruit de Raclement*).

The substance of the heart is essentially muscular, especially in the ventricles, the muscular fibres of the auricles being comparatively few,—so few as to exhibit, that they are not intended for energetic contraction. Its investing membranes are of great interest to the pathologist; and have become so of late years more especially: they are—the *pericardium*, a fibro-serous membrane, the inner or serous layer of which is reflected over the heart, and is lubricated by the serous secretion—the *liquor pericardii;* and the *endocardium*, the serous lining of the heart, which differs on two sides of the organ, that of the right side being very extensible, resisting, and not very liable to ossification; whilst that of the left is scarcely extensible, remarkably brittle, and very liable to bony depositions. (See, on the character and manifestations of the heart's action in health, the author's *Human Physiology*, edit. cit. ii. 126.)

I. INFLAMMATION OF THE PERICARDIUM.

Synon. Pericarditis, Inflammatio Pericardii, Pleuritis Pericardii, Carditis Externa seu Serosa seu Membranosa; *Fr.* Péricardite, Inflammation du Péricarde; *Ger.* Herzbeutelentzündung, Eutzündung des Herzbeutels.

Inflammation of the pericardium may exist both in the acute and chronic form.

a. *Acute Form.*—**Diagnosis.**—When pericarditis occurs with all its characteristic phenomena, and is uncomplicated, it is, perhaps, as easily recognisable as any other internal disease. These phenomena are essentially as follow:—After the occurrence of the ordinary evidences of internal inflammation—an acute, pungent, or lacerating pain in the region of the heart, under the sternum, which extends towards the epigastrium, and sometimes between the shoulders; a sense of more or less oppression, giving rise to rapidity of breathing, often amounting, in the progress of the disease, to panting; palpitation; irregular, jerking, or intermittent pulse; dull sound over the region of the heart; at times, a sound as if two dry surfaces were rubbed against each other, or of the creaking of new leather, (*bruit de frottement* and *bruit de cuir neuf*,) without the existence of any sign of inflammation of the lung or the pleura. Incapacity of lying on the left side has been pointed out by Dr. Joy as amongst the functional derangements most commonly present, but the author has observed it to be very frequently wanting. It rarely happens, however, that there is this catenation of symptoms present; or that the disease is simple: more commonly many of the functional phenomena are wanting; and, not unfrequently, other affections of the chest are present: but what renders the diagnosis more difficult is the fact, that certain of the symptoms are common to different diseases of the heart. Such is the case with the pain in the cardiac region; the sense of oppression; palpitation; irregular, jerking, or intermittent pulse, &c.

The pain experienced in pericarditis is frequently very dull, and so

slight, that it can only be detected by percussion, or by pressing upwards on the epigastrium, and on the left hypochondrium in its vicinity; and when the disease is complicated with violent pneumonia, pleuritis, or articular rheumatism, the pain is frequently masked or obscured by that which accompanies those diseases. In the course of the disease, severe pain is often experienced in the shoulder-blade, and towards the shoulder; but this seems to be neuralgic, and generally soon shifts its seat towards the anterior part of the chest, or wholly disappears. Frequently, too, pain, when it exists, is referred to the epigastrium and left hypochondrium, more than to the region of the heart. When positive pain is not experienced, the patient complains of a disagreeable sense of constriction and weight in the chest, which causes the horizontal posture on the back to be preferred. In some cases, lying on the left side aggravates these uneasy feelings, but in others, he can lie as well on the right as on the left side, and in the advanced stage of the disease, he usually prefers the sitting posture, with the body leaning somewhat forward, or to the left side.

The blood, when drawn, always exhibits a buffy coat, and the coagulum is generally firm. The degree to which the system sympathizes varies greatly. Usually, the face is flushed, and expressive of great anxiety, and the fever runs high; but in other cases, which have nevertheless proceeded towards a fatal termination, the febrile symptoms have been slight, and the temperature of the skin, throughout the greater part of the disease, has been but little higher than natural. Intermission of the pulse is not unfrequently the character which strongly attracts the attention of the practitioner; yet it is often absent until within a short period of the fatal termination; and at times, even when the solid effusion has been considerable, it has been wanting. The author watched attentively two fatal cases, in which, although the pulse was irregular, it was never intermittent. The pain, too, in both cases, was altogether insignificant; but palpitations were induced on the slightest movement of the body.

Dyspnœa coming on suddenly, and without any evidence of bronchial, pulmonary or pleural mischief, is properly considered an important symptom, and should always lead to the suspicion of pericarditis.

Mention has been made of a dull sound over the cardiac region, on percussion, as a sign of pericarditis. This, however, is only present when effusion has taken place into the pericardium. Under the same circumstances, the impulse of the heart will be less, so that it can neither be seen, nor felt by the hand. The supervention of these signs, with prominence or vaulting of the præcordial region, on which M. Louis and M. Valleix lay stress, may diagnosticate the period of effusion.

The first effect of inflammation of a serous membrane—as elsewhere remarked—is to diminish, or totally arrest, the secretion, which takes place from it in health; hence, the sound of friction is an evidence of the early stage of pericarditis. A similar sound may, however, be produced by the friction of plastic lymph, which is often copiously exuded after the inflammation has continued for a time. This friction sound is equally heard during the contraction and dilatation of the

ventricles, and has been—not very euphonically—termed the *to and fro sound.* The sound, thus rendered, has been compared to the rustling of taffeta, bank-note paper, or parchment. When the effusion is very considerable,—in addition to the great and extensive dulness on percussion, the sounds of the heart seem to be distant, and consequently obscure. This secretion takes place at an early period of the disease, and is occasionally very considerable; the quantity of serum effused in the first three or four days amounting, at times, to ten or fifteen ounces. When the disease terminates in health, this is gradually absorbed. Occasionally, there is an evident tumour over the cardiac region. The following tabular view may aid in diagnosticating between the *bruit de soufflet* of endocarditis, and the *friction-sound* of pericarditis.

Bruit de soufflet.	*Friction sound.*
1. The bruit of endocarditis is soft and bowing.	1. This sound presents different shades of rubbing, grating or creaking.
2. Usually single and synchronous with the pulse and impulse.	2. Usually double; louder during the diastole than systole.
3. Prolonged so as in some cases to obscure the natural first sound.	3. Short; seldom obscures the valvular sounds.
4. Murmur distant and deep-seated.	4. Superficial and near.
5. Murmur not limited to the precordial region.	5. Sound limited to the precordial region.
6. Murmur persists in every stage of the disease, and in every posture of the patient.	6. Varies in intensity at intervals; is modified by posture; disappears more quickly under treatment.

At one time, pericarditis was considered to be invariably fatal, but that this is not the case is sufficiently shown by the many opportunities we have of witnessing—in the bodies of those who have died of other diseases—old adhesions between the heart and the pericardium proper. It may terminate fatally in a few days, but more frequently not until two or three weeks; and the fatal termination is preceded, at times, by signs of encephalic excitement. In a very interesting case, which fell under the author's charge some years ago, the patient expired in the most furious maniacal excitement. At other times, the patient sinks to death, with but slight suffering; the fatal termination being preceded by great rapidity of breathing and of pulse; but the senses remaining entire until the very last. At other times, again, the fatal event occurs most unexpectedly, and in a state of syncope. In cases which have terminated in health, the presence of false membranes and of adhesions may occasionally be detected by the friction and creaking sounds before described; and in cases of close adhesion, the contraction of the ventricles has been accompanied by a corresponding retraction of the left portion of the epigastric region. This is, however, a very rare occurrence. These adhesions may interfere with the normal action of the heart, and lead to serious results; but generally the viscus accommodates itself to the new circumstances, and does not suffer.

Causes.—Cold, as in every case of internal inflammation, is assigned as a cause,—especially exposure to damp cold, when heated. It is said, likewise, to have been produced by a blow, by violent exertion, and by mental emotions. It is a frequent concomitant of acute rheu-

matism, so that it has been regarded as almost constituting a part of that painful disease. Of twenty persons, labouring under acute rheumatism, one half, at the least, it is affirmed by M. Bouillaud, exhibit evidences of pericarditis, or endocarditis, or both, and of 136 observed by Dr. Latham the heart was inflamed in 90, or in about two-thirds of the whole. In 11 cases of articular rheumatism occurring in children, MM. Rilliet and Barthez observed pericarditis in 4. It frequently occurs, too, in scarlatina, and sex appears to afford a predisposition, as it is said to attack men more than women. M. Louis found, that in his observation three-fourths of the cases occurred in men; and, according to M. Roche, the ratio is four to one; yet this does not correspond with the observation of the author. In his practice, the disease has occurred more frequently in females. It is seen at all ages, but more especially between those of 12 and 40. Of 55 observed cases, 6 only referred to persons beyond the fortieth year. There is great reason to believe that a predisposition to it is laid in organization. It may attack the fœtus in utero. In children that have died in less than forty-eight hours after birth, adhesions have been found between the pericardium and the heart, so strong as to lead to the belief, that the malady had existed for some time prior to birth. Other diseases of the heart, and pneumonia and pleurisy predispose to it. It would seem, too, to supervene frequently on insanity. According to M. Calmeil, traces of it are met with in one-fifteenth of the insane who die.

Pathological Characters.—The appearances presented after death resemble essentially those of inflammation of the serous membranes in general. When the disease ends fatally, at an early period, there is more or less redness, produced by the injection of the vessels of the sub-serous cellular membrane; yet neither its thickness, transparency nor consistence may be modified. It rarely, however, happens, that death takes place before the inflammation has been attended with effusion of a serous fluid, with more or less plastic lymph; at times, mixed with blood, (*Péricardite hémorrhagique*,) and, at others, with large quantities of pure pus. In some cases, which have fallen under the author's care, and which have terminated fatally in the course of a week, the pericardium has been united, in spots, to the heart, by a thick stratum of plastic lymph, whilst a straw-coloured serum, containing flakes of the same substance, has been contained in the cavity of the pericardium. Where the individual survives the effusion of this plastic lymph, the watery portions may be absorbed; the lymph becomes organized; and hence the old adhesions sometimes met with, when the person has died of other affections. The white spots, seen upon the heart, the *Taches* ou *Plaques laiteuses* of the French pathologists, have been regarded as evidences of previous inflammation; but it is questionable whether they constitute a pathological condition.

The appearances presented by the solid effusion are various,—sometimes resembling a honeycomb at the surface; or having projections upon them like the interior of the stomach of the ruminantia; and at others, the surface of the heart is roughened like the tongue of the cat, or like the exterior of a pine-apple. This arrangement of false mem-

branes is peculiar to pericarditis, and, as M. Grisolle has remarked, is probably owing to the constant and alternate motions of the heart.

Some singular cases have occurred in which pericarditis was caused by a needle having worked its way to the heart. One of the kind has been recorded by Dr. Leaming, of Philadelphia, in which the course of the needle appeared to be indicated by the phenomena. A young woman, when stooping over a table, ran a needle into the right breast. A month subsequently, she was suddenly seized with pleuritis, after stooping to pick up something from the floor. Five months after this, she suffered from pneumonia, with bronchitis of the right lung, and within another month from spasms of the diaphragm, which were succeeded by obstinate vomiting, and subsequently by pain about the heart, and pericarditis. The needle was found after death in the heart, passing from the back through the right ventricle into the left.

Pericarditis is often complicated by endocarditis — constituting *Endopericarditis;* a complication which is indicated by the existence of the *bellows' sound*, and the other functional phenomena and physical signs described under Endocarditis. When the lining membrane is deeply implicated, it adds very materially to the danger of the disease,

Air, it is said, has been found along with the fibrinous sero-purulent secretion, but this must be a rare occurrence. Where it exists alone —*pneumopericardium*—it is said to be indicated by remarkable resonance when percussion is used over the region of the heart—a resonance which is much greater than when a portion of emphysematous lung is between the chest and the heart. When the air is associated with an effused fluid, it may be detected by the sound of splashing, or of fluctuation, perceptible when the chest is shaken, or by a sound of fluctuation or gurgling, caused by the pulsations of the heart.

Treatment.—Acute pericarditis must be met as actively as any of the inflammations of serous membranes, although it is not, perhaps, as dangerous as inflammation of the pleura, peritoneum or arachnoid. Bloodletting should be practised freely, so as to make a decided impression upon the system, and it must be repeated, if the state of the patient should render it necessary, along with cupping, or the application of leeches. If the carditis should continue unsubdued after general bloodletting, local bloodletting may be employed alone with advantage. Of late years, it has been strenuously recommended to bleed largely and repeatedly; and M. Bouillaud asserts, that he has, by this plan, rarely failed to cut short the disease, when he has been called early. He generally bleeds three or four times from the arm, to the amount of sixteen ounces each time, within the first four days, and employs leeching and cupping very freely. As, however, he believes almost all cases of acute rheumatism are complicated with pericarditis, and treats them accordingly, his estimates are probably too favourable. It is certainly good treatment to endeavour to strangle the inflammation at the onset by bloodletting; but if it should not succeed, when aided by the sedatives mentioned below, no time should be lost in having recourse to mercurial and other revellents. The safest course —even should the pulse be irregular and feeble, and the signs of general debility considerable—is to bleed, if the disease have been of short

duration; but, on the other hand, the cupped and buffy appearance of the blood must not induce the practitioner to push the lancet too freely; for this, especially where the disease has a rheumatic origin, will commonly continue,—as the author has observed,—notwithstanding the bloodletting; and, it is affirmed, will even augment under its use.

Along with the bloodletting, general or local, the tartrate of antimony and potassa may be administered either as a nauseant[a] or as a contrastimulant.[b]

[a] R.—Antim. et potass. tart. gr. ij.
Tinct. digit. gtt. xl.
Aquæ f℥vj.
Dose, one-fourth, four times a day.

[b] R.—Antim. et potass. tart. gr. xij.—xxiv.
Mucilag. acaciæ f℥iij.
Aquæ f℥vi.—M.
Dose, a tablespoonful, every two hours.

Should, however, the necessary tolerance, as regards the tartrate of antimony, not exist, it must be discontinued after the second or third dose. The author was of opinion, that a very serious case of rheumatic pericarditis, combined with endocarditis, was saved by the sedation induced by the acetate of morphia, which caused insupportable nausea, that did not entirely cease for forty-eight hours.

Colchicum often proves useful, and, it has been thought, especially so when the disease is of rheumatic origin.

After bloodletting has been freely practised, revellents may be had recourse to—as blisters over the cardiac region, and sinapisms to the feet; and large emollient poultices; or the dry hop fomentation,—made by placing hops between two pieces of flannel, and heating the bag,—may be kept over the chest. Cathartics exert their agency partly as revellents, and partly as depletives or simple evacuants, but care must be taken that the patient is not unnecessarily disturbed during their operation.

When the disease does not yield speedily, and effusion is apprehended, it has been advised to give mercury so as to induce rapidly a complete and continued salivation, but the revellent action will be established sufficiently without pushing it farther than merely to exhibit its first effects upon the system. With this view, calomel may be prescribed.

R.—Hydrarg. chlorid. mit. gr. viij.
Morphiæ acet. gr. ss. fiant pilulæ iv.
Dose, one, four times a day.

The cuts made by the scarificator, or the leech-bites, or the blistered surface—if any there be—may likewise be dressed with mercurial ointment, which, if necessary, may be placed also in the axillæ, and left there to be absorbed. Should the internal use of mercury disagree, reliance must be placed altogether on the external.

The diet should be of the mildest kind, and consist of cooling, demulcent drinks, as lemonade, barley-water, gum-water, &c., and the strictest quiet—mental and corporeal—be enjoined.

b. *Chronic form.*—**Diagnosis.**—Chronic pericarditis gives rise to modifications of the same symptoms as the acute; except, that they are less marked, and, consequently, more difficult of detection. They resemble, on the whole, those of hydro-pericarditis and of organic disease of the heart. Pain is generally present, which may be con-

stant, or occur at intervals, and be accompanied by palpitations and more or less dyspnœa. The pulse is usually very frequent, and may be more or less irregular. Where effusion has taken place, this will be indicated by the signs described under Acute Pericarditis; and it is considered to be a symptom of adhesion between the pericardium and the heart, when there is a kind of abrupt, undulatory, jogging or tumbling motion of the organ, on placing the hand or ear below the part where the heart strikes in health.

The physical signs are similar to those of acute pericarditis, of which it is commonly a sequel.

The disease generally terminates fatally, or it may end in organic disease of the heart.

Pathological Characters.—These are the same as in acute pericarditis; excepting, that time has usually elapsed for the formation of firm adhesions between the pericardium and the heart, and, perhaps, of white spots on the pericardium, occasioned by the organic changes in the sub-serous tissue produced by the inflammation.

The disease may be of the chronic form from the first, or it may be the sequel of the acute form.

Treatment.—This must consist, essentially, of revellents—as cups, with or without the scarificator, over the region of the heart; and intermittent vesication by the *ceratum cantharidis*, which is preferable to perpetual blisters. A seton over the region of the heart has been advised by some; or friction with the tartarized antimony ointment or croton oil; or the application of the moxa. Mercurials, administered in small doses,[a] so as to produce their effects upon the system, are beneficial upon the same principle.

[a] R.—Hydrarg. chlorid. mit. gr. iv.
Morphiæ acet. vel
——— sulph. gr. j.
Confect. rosar. q. s. ut fiant pil. iv.
Dose, one, night and morning.

Colchicum, given as advised under Acute Rheumatism, is said to have sometimes proved adequate to the cure, on persevering many months in its exhibition.

Where tumultuous action of the heart exists, digitalis may be given internally, or be administered endermically, as recommended under Hypertrophy of the Heart.

All sudden and powerful mental and corporeal excitement must be avoided, but advantage may be derived from easy gestation. The diet must likewise be gently nutritious, and yet devoid of every stimulating property.

II. DROPSY OF THE PERICARDIUM.

Synon. Hydropericarditis, Hydrops pericardii, Hydropericardia, Hydropericardion, Hydropericardium; *Fr.* Hydropéricarde, Hydropisié du Péricarde; *Ger.* Herzbeutelwassersucht.

Diagnosis.—The symptoms and signs, referred to under Acute Inflammation of the Pericardium, as indicating effusion, are those that diagnosticate hydropericarditis. When the ear is applied to the cardiac region, the sounds of the heart are found to be dull, and, at times, not

perceptible. The region of the heart is prominent; the intercostal spaces are greater than in health, project, and are soft and doughy. Percussion affords a dull sound over this region; the pulse is generally small, unequal, irregular, or intermittent; the respiration impeded and hurried; and the dyspnœa at times so great, that the patient cannot breathe, except when upright or leaning forward, so that the fluid may gravitate from the heart to the pericardium: the *dyspnœa* amounts—in other words—to *orthopnœa*. For the same reason, rest is more easily obtained by lying on the side affected; the sense of suffocation is often great; and the individual starts from his sleep under the influence of frightful dreams or a feeling of impending danger, breathing with excessive difficulty. It has been affirmed, however, that in cases in which there is co-existing effusion into the pleural cavity, the patients, from the commencement of the disease, cannot bear the horizontal posture; and that, where the effusion is confined to the pericardium, they prefer to lie with the head remarkably low. The reason assigned for this is, that the weight of the fluid is taken from the diaphragm and rests on the spine. In cases of hydrothorax, when the patient lies in this position, the fluid flows back and presses on the root of the lungs, thereby preventing the free ingress of air, and causing dyspnœa and sense of suffocation. In hydrops pericardii this cannot take place, in consequence of the water being inclosed in a firm bag, which is bound down to its place by its attachment to the diaphragm. In very severe cases, the face is pale and swollen, and, where hæmatosis is materially interfered with, livid; infiltration of the limbs supervenes; and the patient expires,—at times suddenly, as in other chronic cardiac diseases.

Causes.—Dropsy of the pericardium is rarely a primary disease. It generally supervenes on chronic pericarditis, or on some disease of the heart, or lungs, which interferes with the circulation of the blood through the organs. It likewise appears under the same circumstances, and the same organic causes, as other dropsies.

Pathological Characters.—Much diversity of sentiment exists as to the quantity of fluid in the pericardium, which may be esteemed to constitute disease. Six or seven ounces have been regarded as dropsy by M. Corvisart,—the quantity exhaled at the time of death from other diseases never, perhaps, amounting to more than one or two ounces, according to M. Bouillaud. This accords with the author's own observation. In some cases, the quantity of fluid collected is astonishing—two or three pints; and in one case, given by M. Corvisart, as much as ten have been met with. In a case described by Dr. Wright, of Baltimore, in which four quarts of purulent fluid were found in the pericardium, there was, strange to say, not the slightest evidence of impediment to the heart's action; the pulse was free, moderately full, and regular; there was no embarrassment of breathing; no distress of countenance; no syncopè; no cardiac pain; and no infiltration of the extremities: circumstances which confirm the remark already made, as to the difficulty in the diagnosis of cardiac diseases. In a case recorded by Dr. Samuel Jackson, of Philadelphia, formerly of Northumberland, at least two quarts of almost limpid water were contained in the pericardium of a female who died six hours after delivery,

without there being any signs of inflammation of the pericardium, or of any part of the chest.

The anatomical lesions vary according as the hydropericarditis is accompanied, or not, with pericarditis, or with some organic disease of the heart. If it be the result of pericarditis, the appearance of the membrane and the effused fluid will be such as have been described elsewhere. If, on the other hand, the effusion be owing to a loss of balance, occasioned by chronic disease of the heart or any impediment to the venous circulation, the fluid may be perfectly limpid and colourless. At other times, it is fawn-coloured, greenish, or yellowish,—the yellow having, at times, the tint that characterizes the solutions of gold.

When fluid has long pressed upon the lung, the organ may become atrophied. There are no cases on record in which a similar effect has been produced on the heart by the fluid of hydropericarditis; but this result has been observed from the pressure of the pseudo-membranous secretion.

Treatment.—This is essentially the same as in chronic pericarditis,—namely, revellents to the cardiac region, with diuretics, and mercurials, singly, or combined.

℞.—Scillæ pulv. gr. j.
Hydrargyri chlorid. mit. gr. ss.
Ol. junip. gtt. ij.
Extract. taraxaci gr. iv.—M.
Divide in pil. ij. ter die sumend.

℞.—Potassæ bitartrat. ℥ij.
Cort. limon. ℥i.
Aquæ ferventis Oij.—M.
To be used for common drink.

The plan of treatment, recommended in hydrothorax, is equally applicable to hydropericarditis.

It has been proposed, when all means for promoting the absorption of the effused fluid have failed, to perform the operation of paracentesis of the pericardium,—either through the fifth or sixth intercostal space, according to M. Dessault; between the xiphoid cartilage and the cartilages of the seventh rib, according to Baron Larrey; or by trepanning the sternum, according to M. Skielderup. It has likewise been recommended by MM. Richerand and Velpeau, in order to obtain a radical cure, to inject excitant substances into the pericardium as in cases of hydrocele, but the judicious practitioner will be cautious in having recourse to such formidable modes of procedure.

III. INFLAMMATION OF THE HEART.

Synon. Carditis, Inflammatio cordis, Empresma carditis, Inflammatio carditis, Cauma carditis, Myocarditis; *Fr.* Cardite, Inflammation du cœur; *Ger.* Herzentzündung, Entzündung des Herzens.

Inflammation of the substance of the heart, to which the term *carditis* is commonly applied, is probably a rare affection,—much more so than that of the lining membrane or endocardium—thence called *Endocarditis* or *Carditis interna;* Ger. *Herzhöhlenentzündung.* It is difficult, however, to suppose, that the pericardium or endocardium can be extensively inflamed without the substance of the heart participating.

a. *Acute form.*—**Diagnosis.**—The symptoms of acute inflammation of

the substance of the heart are not well determined; and hence, as M. Valleix has well remarked, it is greatly to be desired that the affection should be studied with method and perseverance; for the difficulties of the study are very great. Along with the phenomena of internal inflammation in general, we may expect more or less pain. with violent palpitation, dyspnœa, sense of suffocation, augmented impulse of the heart, great anxiety, fainting, &c. Where the lining membrane of the heart is the chief, or only seat of the disease, an affection, which is much more common than is generally believed,—as much so, according to some, as pericarditis,—the above symptoms are usually present accompanied with a *bruit de soufflet* or *bellows' sound.* This bellows' sound is admitted to be one of the most constant and characteristic of the phenomena of endocarditis. It varies in intensity, and is, at times, so great as to mask one or both of the sounds of the organ. It is owing probably to the diminution in the size of the ventricles or their orifices, produced by the inflammatory engorgement of the lining membrane and its consequences. The impulse of the heart against the chest is generally so forcible and superficial as to be distinctly seen, and readily recognisable by the hand. The pain is commonly very slight, and, in many cases, the author has observed none whatever; nor is the dyspnœa urgent, unless the membranes of the chest are simultaneously affected, or the action of the heart is so irregular or tumultuous as to impede the due circulation of the blood. Of 33 cases from different authors analyzed by M. Valleix, in 2 only was there a somewhat acute pain in the præcordial region, which could be attributed to endocarditis.

The impulse of the heart is perceptible over an unusual surface, which is supposed to be owing to the inflammatory turgescence of the organ; and for the same reason, there is dulness of percussion over a larger surface—twice as large as in health, according to M. Bouillaud, who has the merit of having greatly extended our knowledge of this important malady. There can be no mistake between this dulness of sound of endocarditis and that of hydropericardium. The former—as already remarked—is accompanied by the bellows' sound, and the beat of the heart appears quite superficial, whilst it is indistinct and remote in the latter, and varies remarkably with change of posture, both as to the points, and the degree in which it is felt.

The blood, when drawn, always exhibits a great predominance of fibrin, and when coagula form in the cavities, they may, by reason of the great plasticity of the blood, adhere to the endocardium, and be ultimately organized, giving rise to the polypiform concretions occasionally met with, and described hereafter.

The urine, in a case examined by M. Simon, presented "the elements of a true inflammatory urine." The urea considerably exceeded the healthy average; the fixed salts collectively were diminished; whilst the sulphates were only a little below the normal standard, and the uric acid and extractive matters were increased.

In very acute cases, the disease may terminate fatally in a few days; and in cases of what the French term *Cardite foudroyante*, death takes place at times very suddenly. Rupture of the heart is met with under these circumstances. Where the disease terminates in a few days,

death is often owing to fibrinous concretions, which form in the cavities of the heart, and obstruct the circulation of the blood through that viscus. Most commonly, however, endocarditis terminates by resolution; the false membranes—if they have existed—being wholly or in part absorbed, so that auscultation may exhibit nothing abnormous. Frequently, however, the author has observed a distinct bellows' sound remaining for a long period, and for life, indicating the existence of some degree of narrowness occasioned by the plastic effusion; and it is, doubtless, a common cause of valvular disease of the heart. Of sixty-three cases of endocarditis occurring in acute rheumatism, and recorded by Dr. Latham, not one died; the disease—even in individuals commonly of deteriorated constitutions—being, consequently, not one involving much peril of life. It would seem, however, that restoration of the endocardium to its healthy condition is rare. In 46 of the cases, the membrane remained permanently injured; and in 17 only it appeared to have recovered its complete integrity of structure. Endocardial murmur at least totally disappeared from 17 hearts only. Of 11 cases of endopericarditis, occurring in acute rheumatism, 3 terminated fatally. In none of the 8 cases of recovery did Dr. Latham believe, that complete restoration of the structures to the healthy state ensued.

Causes.—These are the same as those of pericarditis. The most common of all is the *metastasis*, or the *extension* of the rheumatic inflammation; for it is not clear to which it ought, of right, to be ascribed. The common idea, with the best pathologists, is, that rheumatism is a metastasic or changeable phlegmasia, and that it leaves the joints to affect the heart; but there are plausible reasons for the opinion, that the pericarditis is rather an extension of the arthritis. Therapeutically, this is not a matter of much moment, as in all cases the supervening carditis or endocarditis must be treated as if it were a primary affection.

An analysis of 28 cases by MM. Bouillaud, Hope, and Grisolle, would seem to show that sex offers no predisposition.

It must be borne in mind, that there are certain poisons, as arsenic, which leave spots of a violet red hue on the heart, with softening of the endocardium.

Pathological Characters.—Redness of the substance of the heart or its lining membrance—at times having a bluish or brownish tinge—has been esteemed a constant sign of carditis or endocarditis; but redness is often met with, when there has been no reason to suppose that inflammation of the viscus had existed. In such cases it is cadaveric, and is produced by the imbibition of the blood; hence it is that we have cases of endocarditis and of aortitis, which never existed except in the imagination of the practitioner. It has been asserted, that the cadaveric redness is removed by washing, whilst the inflammatory is not; but this is an inadequate test. It has also been affirmed, that if we examine carefully, we observe, that in carditis the capillary vessels are injected, are manifest in the cellular tissue, and can be followed as far as the origin of the principal trunks, which always participate in the inflammation. In cadaveric redness, on the other hand, the vessels are not manifest, and the redness is so uniform, that it might be said the

surface of the heart was dyed. In the inflammatory redness, too, there is this important difference,—that it has generally the same character and the same shade everywhere, whilst in cadaveric hyperæmia, according to M. Andral, it is a brown red in the right heart, and a vivid red in the left. The microscope exhibits, too, in the former case, organic changes, which are not perceptible in the latter. The redness is generally most marked in the part of the endocardium that invests the valves and the orifices.

Inflammation induces, at times, *ramollissement* or mollescence of the muscular tissue of the heart or of its lining membrane, which latter becomes so soft, that it can be readily removed by scraping with the back of a knife, or using the forceps. Induration is likewise one of its consequences; but it is more frequently met with in the chronic form.

Another termination of carditis is suppuration. The abscess may form either immediately beneath the endocardium, or in the substance of the heart, or in the septum between the ventricles. The opinion has been hazarded on the high authority of M. Andral, that the presence of these abscesses is not a certain index of inflammation of the organ. Such abscesses have been seen after important surgical operations, phlebitis, &c. It is not easy, however, to embrace the opinion, that they were not the result of carditis; yet, if so, it must have been restricted to very slight limits, and most rapid in the termination of the inflammation.

Ulcerations are occasionally met with—sometimes, externally, at others, internally. At one time they were esteemed much more common than they now are,—false membranes having been often confounded with them. These last are not very frequently seen. When formed, they may be acted upon by the blood, and be carried back again into the circulatory current. The same may be said of purulent and other secretions from the endocardium. Where they do exist, however, they may be esteemed unquestioned evidences of previous endocarditis. The false membranes occupy the valves more especially, which are thickened.

Acute inflammation of the endocardium may, likewise, occasion narrowness of the orifices, roughness, and granulations of the membrane, and the production of vegetations, which give rise to the bellows' and other abnormous sounds of the heart, described under diseases of the cardiac valves.

Treatment.—This is identical with that recommended under Acute Pericarditis.

b. *Chronic form.*—**Diagnosis.**—The symptoms of chronic carditis and endocarditis are not very distinctive. More or less painful uneasiness or anxiety may be felt in the cardiac region, with occasional palpitations, and oppression; but no clear signs may be afforded by auscultation or percussion. Should any narrowness in the orifices exist, a bellows' sound may be heard. All these evidences of disease may, however, be very slight, and yet the frequency and irregularity of the pulse may direct the attention of the practitioner to the nature of the affection.

When chronic carditis gives rise to organic disease of the heart, the particular affection is denoted by its appropriate symptoms.

Pathological Characters.—The main morbid appearances in chronic endocarditis are as follows:—thickening of the endocardium; vegetations or granulations on its surface, which may be globular or warty,—the former being commonly of a softer texture, like concrete albumen or fibrin, which has as yet undergone little change,—the latter of a firm, or horny, or cartilaginous consistence. They are met with of various sizes, and especially on the valves. In addition to these appearances, there may likewise be lymph adherent to the endocardium; alteration of the auriculoventricular valves; adhesion of the auriculoventricular valves to the heart, and of the valves at the mouths of the pulmonary artery and aorta to the sides of those vessels; adhesions also between the valves themselves, which interfere with their functions; ulceration and even total absorption of the valves, &c. &c. Pus is often found in the cellular tissue beneath the endocardium.

Where the substance of the heart has been chronically inflamed, we may find induration, and cartilaginous and osseous depositions in its substance. Some of these changes may, however, be induced, without the existence of inflammation, by modified nutrition of the part from other causes. This, at least, is probable.

Treatment.—The treatment is essentially that of chronic pericarditis.

IV. HYPERTROPHY OF THE HEART.

Synon. Hypertrophia cordis, Hypersarcosis cordis, Cor bovinum; *Fr.* Hypertrophie du cœur, Hypercardiotrophie (*Piorry*); *Ger.* Substanzvermehrung oder Vergrösserung des Herzens, Hypertrophie des Herzens, Herzhypertrophie.

Hypertrophy of the parietes of the heart is not uncommon. It may occur along with dilatation, diminution, or the natural condition of the cavities. "These puerile distinctions," observes M. Rostan, "have fixed, in a singular manner, the attention of persons who see few patients; but they attract little attention from those who cultivate medicine in a vast field of observations." The remark is more severe than just, when applied to such men as Laënnec, Bertin, Hope, and Williams, all of whom have adopted three varieties—one in which the hypertrophy is simple; another in which there is a dilatation of the cavities; and a third in which there is concomitant contraction.

In the opinion of many, the parietes of the left ventricle are more frequently hypertrophied than those of the right. Dr. Swett, of New York, in 48 cases, in which the enlargement of the heart was partial, found the left side most commonly affected, in the proportion of 17 to 8. But this is not the view of all: on the contrary, the accurate author of the numerical method asserts, that of 49 cases of hypertrophy of the ventricles, 29 were of the right ventricle. The auricles are still more rarely hypertrophied; and scarcely ever alone. They usually participate in the condition of the corresponding ventricle.

When dilatation of the cavities accompanies hypertrophy, the whole heart is enlarged. This constitutes the *active aneurism* of the heart, or *eccentric hypertrophy.*

Hypertrophy, it is believed, may affect particular parts of the heart only—as the auriculoventricular valves; the interventricular septum;

different points of the parietes; the columnæ carneæ, &c.; but the existence of partial hypertrophy of the septum, and of the columnæ carneæ, has been denied by M. Cruveilhier.

Concentric hypertrophy is when the parietes augment at the expense of the cavities—constituting the *cardiarctie* of Piorry—a form of the disease which is familiar to us; yet its very existence has been contested by M. Cruveilhier.

Diagnosis.—The augmented size of the muscular parietes of the heart would lead us to expect the exertion of greater force of contraction. Such is the fact. The pulsations are much stronger than in the healthy state;—so strong, indeed, as to raise the side of the chest, and to be perceptible to the sight and touch over a greater or less extent of surface; and, at the end of each pulsation, there is a jog or shock which has been termed the *back stroke*, or *diastolic impulse*, and would seem, as suggested by Dr. Hope, to be owing to the refilling of the ventricles. The head or the hand applied over the region of the heart is forcibly raised, and the movement of the bedclothes, when the individual is in the horizontal posture, and of his dress when he is up, is strikingly apparent. Generally, the pulsations of the heart are distressing to the patient, but, at times, when distinct to the physician, they are not perceived by the sufferer himself. When the hypertrophy is unaccompanied by dilatation of the cavities, the sound of the heart is dull and obscure; the contractions take place slowly, and extend only to the præcordial region; when, however, the hypertrophy is accompanied by dilatation, the sounds are clear and extensive.

In all cases of hypertrophy, the patient is liable to an increase in the frequency of the heart's action, or to palpitations, which are at times excessive, and during the existence of which, the physical signs, above described, are more evident.

Percussion gives occasion to a sound, which is more dull than natural, but the difference may not be marked even to a practised observer. The pulse is generally sufficiently diagnostic of the energy of the heart,—being strong, jerking, or vibratory; but when palpitations are induced,—and they readily are by unwonted exercise, as running, especially up stairs, or by any moral emotion,—the pulse participates in the frequency and tumult of the central organ of the circulation. Under these circumstances, the pulmonary circulation cannot be accomplished as in health; the blood is not freely returned to the left heart, and dyspnœa and oppression of breathing supervene. Owing, likewise, to the blood being forcibly sent along the arteries, the face is generally flushed or florid, and hyperæmia, ending in hemorrhage, or true inflammation, is apt to be induced. In younger individuals, this is exhibited by the supervention of epistaxis; in older, by apoplexy.

The physical signs vary somewhat according as the hypertrophy is general, or restricted to the left or the right ventricle. When general, the pulsations are felt both to the right and left of the median line, and at times extend even to the epigastrium; when in the left ventricle, the pulsations are more sensible on the left side towards the

cartilages of the fifth and sixth ribs; and when the hypertrophy affects the right ventricle, they are felt under the inferior part of the sternum, and much less to the left of the median line. It can be understood, that this form of cardiac hypertrophy may give occasion to hæmoptysis; and, as the right auriculoventricular valves are insufficient to prevent a part of the blood of the ventricle from reflowing into the corresponding auricle, an impulse may be given by the refluent blood, during the energetic contractions of the ventricles, to the blood arriving by the descending vena cava, so as to occasion the phenomenon in the jugular veins, termed the *venous pulse—phlebopalia.* It is probable, however, as has been suggested by Dr. Hope, that this jugular pulsation may be induced without the reflux in question; and that an impulse, fully adequate to the effect, may be given by the auriculoventricular valve of the right side, driven, during the contraction of the ventricle, when the heart is enlarged, and acting impetuously against the column of blood in the right auricle and venæ cavæ.

When a decided impediment exists to the flow of blood from the cavities into the corresponding vessels, which is a common cause of hypertrophy, other phenomena are associated with those described above; one of these is the *frémissement cataire* or fremitus like the purring of a cat—a tremulous condition of the organ during its systole, which is distinctly felt, not only when the ear is placed over the cardiac region, but likewise by the hand. It is in these cases more especially, that the bellows' sound is largely developed. Whenever, indeed, the two signs exist together, along with the other evidences of hypertrophy, we can have little doubt in inferring the existence of obstruction to the passage of the blood from the ventricles into the arteries.

When hypertrophy of the heart terminates fatally, it is generally owing to the induction of asphyxia, or of other diseases—especially dropsy. The prognosis, indeed, of every form of hypertrophy must be guarded. Sudden death occurs only in cases in which a clot exists in the heart, or where there is a rupture of the organ.

Causes.—The chief causes might be supposed to be mechanical obstacles—as affections of the orifices of the heart, which narrow them, and give occasion to a more powerful contraction of the muscular fibres that form the parietes of the organ;—insufficiency of the valves, which permits a certain portion of the blood to reflow into the cavities, and consequently gives occasion to more energetic action of their parietes;—and narrowness of the arteries that emanate from the ventricles, either owing to the deposition of fibrinous matter on the inner coat, or of ossific points. In the author's experience, this state of the vessels has been most frequently connected with the hypertrophied condition of the heart after acute rheumatism, in which the *bruit de soufflet* and the *frémissement cataire* have been marked. Amongst the other causes of hypertrophy have been reckoned—inflammation of the pericardium, palpitation, chronic disease of the lung, and too much action of the heart, howsoever induced. M. Beau having found many cases of hypertrophy in which adhesion, so strait that the play of the

valves of the heart might be impeded by it, existed, has regarded such adhesion as a cause of this disease, and similar observations have been made by Dr. Hope. From certain unpublished researches, however, of M. Louis, which were submitted to M. Valleix, it would seem, that adhesion of the pericardium to the heart has not been met with in any considerable degree more frequently in diseased than in healthy hearts. It is proper, too, to remark that the same distinguished observer asserts, that in three-fifths of recorded cases there existed no connexion between lesions of the lining membrane of the heart, either at the orifices or other points of its entire extent, and the production of hypertrophy, either with or without dilatation. Both M. Louis and M. Bizot, again, are not of opinion that an obstacle in the circulation of the blood from chronic disease of the lungs is an ordinary cause of pericarditis. They found in the consumptive, whose lungs were so studded with tubercles as to be scarcely permeable to air, the heart, so far from being hypertrophied, considerably diminished in volume; and the same result was observed when a cancerous formation had opposed the passage of the blood through the lungs. M. Louis and M. Valleix consider pulmonary emphysema to be both a predisposing and exciting cause, as the researches of the latter have shown. Should emphysema of the lungs exist for years, the hypertrophy is sure to appear without any special cause, and to make more or less rapid progress. The whole subject, however, of the etiology of hypertrophy requires farther observation.

Pathological Characters.—The heart is sometimes found greatly increased in size, and especially in weight. The increase in the thickness of the parietes varies in different cases, being, at times, double or triple the ordinary size. The cut surfaces are found to be redder, and the substance firmer than natural. Eleven ounces may be regarded as hypertrophy, but the heart may weigh twenty-four ounces, or even more. Cases have occurred in which it weighed two pounds and a half, and upwards.

When the hypertrophy is seated in the left ventricle, it is commonly uniformly thickened: partial hypertrophy is rare. At times, it has been found from an inch and a half to two inches in thickness. When the hypertrophy is in the right ventricle, the thickening is generally irregular; the greatest being near the base, where it is often twice as thick as usual. In almost all cases, the columnæ carneæ participate in the hypertrophy. When it is limited to the left ventricle, the right appears to be—and perhaps occasionally is—atrophied. At other times, the right ventricle alone is implicated, and acquires the thickness of the left; whilst at others both are equally affected; but this is the rarest case of all. The cavities of the ventricles may be augmented in size, diminished, or natural.

As the hypertrophy is commonly owing to some obstruction in the outlets of the heart, in protracted cases more especially, cartilaginous or bony concretions may be found in the semilunar valves, and, at times, ossific deposits in the aorta. Calcareous concretions are likewise seen occasionally in the auriculoventricular valves.

At times, in hypertrophy of the parietes, the heart itself is much

less than usual; the increased thickness having been formed at the expense of the cavities. In a case, published by Dr. James Johnson, the heart was not more than half the natural size, yet the parietes of the left ventricle were full an inch in thickness. This had encroached so much upon the ventricle that it could not contain more than three teaspoonfuls of blood. A similar case has recently occurred to the author.

Treatment.—In the early stages of hypertrophy, of every form, bloodletting is indicated, especially if it occurs in young and plethoric individuals, and it may be repeated according to the judgment of the practitioner. Generally, however, it is more advisable, after the first, to draw blood by leeches, or by cupping, so as to have the joint effect of the depletion and revulsion thereby induced. The method, advised in cases of aneurism,—of beginning with copious bleeding every three or four days, and lengthening the intervals gradually, until the signs of hypertrophy are greatly diminished, has been recommended by many, but care must be taken not to reduce the powers too much, especially if there be much tendency to hydropic effusion.

Along with the bloodletting, in the cases above mentioned, it has been advised to diminish the diet, until the individual arrives at the minimum quantity required for his sustenance;—perfect mental and corporeal quietude being, at the same time, rigidly enjoined. The followers of this rigorous system recommend, that the quantity of food or nourishment should not even be gradually augmented, until several months after the disappearance of the signs of heart disease; and that the patient should not be permitted to engage in any occupation that may even appear to be most suitable for him, until at least one year has elapsed. This very restrictive system is rarely, however, needed, and is, at times, for the reasons already assigned, objectionable. Occasional cupping, with the employment of other revellents—as of the croton oil, (four to six drops rubbed on the cardiac region twice a day,) sinapisms, and the avoidance of every cause of excitement, are generally sufficient to moderate the hypertrophy. To remove it, when it has once formed, is probably beyond the efforts of art. Some interesting observations have been made by M. Chossat, which have a bearing on this subject. He found, that in all animals killed by starvation, after the fat the muscular system bears almost the whole loss, and that the heart suffers in a like degree, so that the state of the heart might always be judged of from that of the muscles; and conversely, their state might be estimated from that of the heart. It has long been observed, too, that in the process of training animals, which causes an increase of the development of the muscles, there is a marked enlargement of the muscular structure of the heart. This would encourage the adoption of a restricted diet in cases of hypertrophy: still, the influence would probably be exerted on every part of the muscular structure of the organ, not on the hypertrophied portion only, and therefore the salutary result might be limited.

As sedatives, digitalis and hydrocyanic acid are excellent adjuvants to the means already advised. They may be given alone or in combination; or the cyanuret of potassium may be substituted for the

hydrocyanic acid, (a quarter of a grain in the place of a drop of the acid.)

℞.—Acid. hydrocyan. gtt. iv.
Tinct. digital. gtt. xl.
Mucilag. acaciæ f ℥iij.
Aquæ f ℥ivss.—M.
Dose, a fourth part, four times a day.

M. Bouillaud, who has the highest opinion of digitalis in active diseases of the heart, prefers the endermic mode of exhibition, by applying a blister over the præcordial region, and sprinkling fifteen or sixteen grains of the powder on the raw surface daily. In similar cases, the acetate of lead is sometimes given, alone or in combination with the acetate or sulphate of morphia, but it is less efficacious than the sedatives already mentioned.

℞.—Plumb. acet. gr. vi.
Morphiæ sulph. vel acetat. gr. j.
Confect rosæ q. s. ut fiant pilulæ iij.
One, three times a day.

Dr. A. T. Thompson considers, that the most efficient method of unloading the circulation, as well as of lessening the nutritive deposition in the heart, is by the use of elaterium as a cathartic.

℞.—Elater. gr. j.
Alcohol f ℥ij.—Solve.
Dose, eight minims, in a wineglassful of water, three times a day.

Advantage may, doubtless, be derived from this as well as from other cathartics in simple hypertrophy, but still more when the disease is accompanied by hydropic symptoms. It is in such cases that we administer diuretics likewise, — the strongest objection to which is, that they are somewhat uncertain in their operation. The author is in the habit of employing the *pulvis jalapæ compositus* (gr. xxx.—xl.), which consists of jalap and the bitartrate of potassa, as a cathartic in these cases; and, to exert a joint diuretic and cathartic effect, he adds the latter article in solution:[a] or digitalis and colchicum may be given in combination—both agents having the power of controlling the action of the heart;[b] and, as in other cases of hydropic accumulation, the joint revellent and depleting action of a diuretic and a mercurial may be advantageously used.[c]

[a] ℞.—Baccar. junip. ℥ss.
Potass. bitart. ℥ij.
Aquæ bullientis Oj.—M.
To be used for common drink.

[b] ℞.—Tinct. digital.
—— colchic. āā gtt. vj.
Aquæ f ℥iss. f. haustus ter die sumendus.

[c] ℞.—Hydrarg. chlorid. mit.
Scillæ pulv.
Digital. pulv. āā gr. j. f. pil. ter die sumenda.

It has been already remarked, that great care must be taken, that the diet be neither excitant by quantity nor by quality. Milk diet has been highly extolled; and, where it agrees, none can be better, especially if it be associated with the farinaceous vegetable.

V. ATROPHY OF THE HEART.

Synon. Atrophia cordis, Thinness of parietes of the heart with dilatation of the cavities, Dilatation of the heart, Cardieurysma; *Fr.* Atrophie du cœur, Acardiatrophie (*Piorry*); *Ger.* Herzerweiterung, Erweiterung des Herzens.

This affection is by no means so common as hypertrophy. We

meet, however, with occasional examples of the heart of the adult being unusually small, which may be the result of wasting or of disease; but, in the generality of cases, it is probably congenital.

The term atrophy is appropriated rather to a diminution in the thickness of the parietes of the heart than to smallness of the whole organ. On examination, the heart may be of the usual size, but, when cut into, the parietes may be found reduced in thickness, whilst the cavities are correspondingly enlarged. This is a state of atrophy. In other cases, again, the heart may be larger than natural, the cavities becoming larger in proportion as the parietes become thinner, constituting the *cardiectasie* of M. Piorry, and *passive aneurism*, *aneurysma passivum cordis*, in contradistinction to the *active*, already described. A heart, in a state of atrophy, has been found to weigh not more than from five to six or seven ounces.

Atrophy of the heart is generally perhaps partial; and, as before remarked, whilst the left ventricle becomes hypertrophied, the right may be atrophied to such a degree as to be reduced, in the language of M. Andral, to "an imperceptible appendage." This we have never seen, nor any approximation to it.

Diagnosis.—In atrophy of the heart with dilatation of the cavities, we may expect the pulsations of the organ to be dull and prolonged, and the pulse to be regular, but feeble and small. When percussion is practised over the cardiac region, there will be dulness of sound over a greater extent than usual; the impulse of the heart will be diminished, and, at times, cannot be perceived; whilst, on the other hand, the sounds may have become more clear. If the atrophy affects the heart but partially, the evidences will of course be more obscure.

Causes.—Atrophy may be induced by the same causes as hypertrophy. Diseases about the valves, or any obstruction to the flow of blood from the cavities during their contraction, may cause dilatation of the cavity.

Treatment.—If thinness of the parietes of the heart be diagnosticated, and especially if it be presumed to be accompanied with dilatation, the management ought to be the opposite to that recommended under hypertrophy of the organ. In two cases of sudden death, that fell under the author's observation, the cause of death appeared to be the existence of this condition, under which, if syncope should at any time occur, it might prove fatal,—the heart not being able to resume its action.

If, in hypertrophy, bloodletting and depletives in general be esteemed advisable—partly with the view of diminishing the amount of stimulus, and consequently of cardiac action, and partly of breaking in upon the too great nutritive action in the parietes of the heart—an opposite plan is obviously suggested, where the parietes of the organ are greatly reduced in thickness, and at times, as the author has seen them, to such a degree as to be translucent. Accordingly, it has been recommended to administer tonics, as the different vegetable bitters, and the preparations of iron;—the subcarbonate, (gr. x.—gr. xx. three times a day, in molasses,) or the protocarbonate, (gr. iij.—gr. x. three

times a day,) especially. In these cases, as has been properly remarked by M. Andral, we must be careful not to enfeeble the heart, as all its powers may be needed to overcome the obstacle to the course of the blood.

With the same views, a nourishing, but not excitant diet should be allowed.

A kind of *partial aneurism of the parietes of the heart,—Cardiectasis partialis, Aneurysma consecutivum cordis;* Ger. *Wahres Aneurysma des Herzens, Partielle Erweiterung der Herzhöhlen*—has been recorded, consisting of an aneurismal sac or pouch containing concrete fibrin. Several cases are on record. The celebrated French tragedian, Talma, was found to present this lesion on dissection, although no signs had announced its presence during life.

VI. INDURATION AND SOFTENING OF THE HEART.

Synon. Cardiomalacia, Malacosis cordis; *Fr.* Ramollissement du Cœur; *Ger.* Erweichung des Herzens.

Induratio cordis; *Fr.* Endurcissement du Cœur, Cardiosclerosie (*Piorry*); *Ger.* Induration des Herzens, Verhärtung des Herzens.

The nutrition of the heart becomes affected under various circumstances. At times, it is indurated, with or without hypertrophy. This induration may be the result of chronic inflammation, but we know of no signs during life that indicate it.

Softening of the heart may likewise be caused by inflammation of the organ; and it may occur in consequence of some lesion of the function of nutrition, which is independent of inflammation. It is a common concomitant of typhus, and affords valuable indications of treatment, as shown under the proper head. The softening may affect the whole heart, or only a part of it.

Diagnosis.—This is very obscure. A tremulous and intermittent pulse has been mentioned; and great anxiety, occurring during the existence of an organic disease of the heart, has been thought a symptom of importance. In such a condition of the organ, it is to be presumed, that its contractions would not be as energetic, nor the sounds as loud, but in reality we have no symptoms that can be looked upon as pathognomonic.

Pathological Characters.—The condition is easily detected,—the tissue of the heart being readily lacerable, tearing with the slightest pressure of the finger, and, at times, being almost diffluent. The colour of its substance is of a deep red or livid, and, at times of a yellowish or dull white hue.

Treatment.—As we have no diagnostic signs, we can adapt no particular management. We are guided rather by the general symptoms, which may often demand the treatment recommended under Atrophy of the Heart.

VII. RUPTURE OF THE HEART.

Synon. Cardiorrhexis, Ruptura cordis; *Fr.* Rupture du Cœur; *Ger.* Zerreissung des Herzens.

Rupture occasionally occurs, owing to softening of the heart, and

at other times, to thinness of its parietes, and to ulceration,—*Cardielcosis*—the consequence of endocarditis. More than one case is on record, in which the rupture had been occasioned by a needle, previously swallowed, which had pierced the parietes of the organ. It is commonly followed by immediate death, and, on dissection, a quantity of coagulated blood is found in the pericardium. Cases are on record, however, in which death has not been immediate. When the rupture is very small, and is seated where the great arteries leave the heart; or when, if larger, all the fibres are not torn, a clot of blood may form in the solution of continuity, and prevent the copious extravasation of the vital fluid. Partial pericarditis may, likewise, be induced, which may give occasion to adhesion between the pericardium and the heart, so that the person may live for years.

We can readily understand how death may not always occur from rupture of the heart, when we bear in mind the facts on record of wounds of the organ by penetrating instruments, which have not been mortal. The cases are, doubtless, rare; but they have occurred.

Rupture of the left ventricle is much more common than of the right; and the right is torn much more frequently than the auricles. In forty-nine cases of rupture of the heart, collected by M. Ollivier d'Angers, the lesion was seated thirty-four times in the left ventricle, and four times only in the right; twice in the left auricle, and three times in the right. In two cases, both ventricles were torn in several places. When, however, the rupture is the result of external violence, it is more frequent on the right side than on the left. Thus, of eleven cases of this kind, collected by M. Ollivier, the right cavities were found torn eight times, and the left three times; and of the eleven cases, the auricles were six times the seat of rupture,—showing that the parts of the heart which offered the least resistance gave way. In the forty-nine cases above referred to, the rupture was in nine cases at the apex of the organ; but in all the others it was at the base, or on one of the surfaces—anterior or posterior. Rupture may also take place through the interventricular septum, but this is rare.

At times, on dissection, the columnæ carneæ alone have been found ruptured, or the cordæ tendineæ.

As these ruptures are rarely, if ever, diagnosticated, and can, therefore, only be suspected, it is unnecessary to speak of the treatment.

VIII. FIBRINOUS CONCRETIONS IN THE HEART.

Synon. Carditis polyposa, Polypous or Polypiform Concretions, Polypi, Pseudopolypi; *Fr.* Concretions polypeuses ou polypiformes ou sanguines du Cœur, Hémocardioplasties, (Piorry); *Ger.* Herzpolypen, Polypen des Herzens.

In ordinary cases of death, we find, on dissection, some of the fibrinous portion of the blood coagulated in the heart, and either confined to the cavity in which it is chiefly met with, or extending to the arteries proceeding from it. These concretions were at one time looked upon as always morbid, and were termed *polypi*, in consequence of the shape of their extensions. They may, however, take place before death; and at times may interfere with the circulation of the blood through the heart, so as to give rise to physical signs, which

may cause their presence to be suspected. Under such circumstances, they are, doubtless, owing to impediment to the free flow of blood through the pulmonary artery or the aorta, the consequence of which is retardation in its flow through the cavities of the heart, and consequent coagulation. M. Wagner affirms, that the absence of blood corpuscles in their interior is an evidence of their formation some time prior to dissolution;—the columnæ corneæ and cordæ tendineæ acting upon the blood in the same manner as the switch acts upon freshly drawn blood, when we beat it to separate the fibrin from it.

In a case of great impediment to the circulation of the blood through the lungs, which fell under the author's care, and in which, on the application of the stethoscope, the respiratory murmur was totally inaudible in any part of the right lung, whilst it was very distinct in the left; and percussion on the right side gave the dull, heavy, circumscribed sound of a solid mass,—the sound of the left side of the heart was so loud as to countenance the idea of dilatation of the cavity, with thinness of the parietes; whilst on the right side, the sound was indistinct; but there was a peculiar *bruit*, appearing, as it were, compounded of the *bruit de soufflet* or bellows' sound, with the *frémissement cataire*, and evidently indicating the existence of some impediment to the circulation of the blood through the right heart. On the dissection of this case, the right lung was found completely hepatized through its whole extent, whilst the left lung was nearly healthy. On taking out the heart, the right pulmonary artery was found completely plugged up by a semi-organized mass, having the appearance of muscle, extending through the semilunar valves, and attaching itself strongly to the columnæ carneæ of the right ventricle. This morbid production was, doubtless, caused by the engorgement of the lung occasioning a remora of blood in the heart, and deposition of fibrin. The symptoms during life, and the signs afforded by auscultation, as well as the semi-organized appearance of the concretion, showed, that it could scarcely have been formed after dissolution. Many similar cases have been seen by the author, and several have been recorded by Messrs. H. M. Hughes, Bouillaud, Velpeau, Ferrus and others. At a clinical lecture of the author at the Philadelphia Hospital, he exhibited to the class a semi-organized fibrinous concretion in the right ventricle; the existence of which he had diagnosticated before dissolution, owing to the sound of impeded transmission of blood in a person dying of pleuro-pneumonia; and since then he has seen an equally marked case.

It appears to be admitted, that blood, under particular circumstances, may become organized after coagulation in the vascular system, and there is great reason to believe, although this has been doubted, that the same thing may happen to coagula effused into the tissues. No one denies the plastic powers possessed by the liquor sanguinis or coagulable lymph of the blood; and it is difficult to see, that when contained in blood it may not be possessed of the same properties.

Diagnosis.—This cannot be easy. It has been conceived, however, that if, along with an increased, irregular, and confused action of the heart, there be a sudden and excessive aggravation of dyspnœa, without any obvious cause, the patient being in agony from an intolerable

sense of suffocation, remaining restless and distressed till death, with cool surface and extremities, and a livid countenance, occasionally accompanied with nausea and vomiting, the presence of a fibrinous concretion of the heart may be suspected. It is not clear, however, what can be the connexion between this state of the heart and the affection of the stomach: the nausea and vomiting can only be regarded as accidental concomitants.

Occasionally, the polypoid or polypiform concretions induce death by blocking up one of the apertures of the heart.

Pathological Characters.—Two kinds of polypiform concretions are met with,—one which forms after death, or during the last moments of life,—the other, which forms during life, and may give rise to phenomena that may indicate their presence.

The concretions that form after death, or during the last moments of life, are generally of a dark colour, soft, friable, and moist. They may exist indifferently in both sides of the heart, and are most commonly found in both; they are of considerable size, sometimes distending one or more of the cavities, and passing into the vessels communicating with them. They are never adherent; but, at times, offer resistance to their being withdrawn, owing to their being interlaced with the columnæ carneæ, and chordæ tendineæ.

The concretions that form before death are, according to Laënnec, of a grayish or yellowish-white colour, and fibrinous texture; elastic and resisting; interlaced with the columnæ carneæ, and adherent to the walls of the auricles and ventricles, either immediately, or by means of a grayish false membrane, thus indicating the existence of previous inflammation, which may have been the efficient cause of the concretion. These concretions may vary in size like the former; but they are rarely as large; and, more frequently, they are limited to the right ventricle, extending into the pulmonary artery. M. Grisolle affirms, that anatomical inspection will enable the two varieties to be readily distinguished from each other; but it is easy to see, that great difficulty may arise at times, especially in discriminating those that have formed a few hours prior to dissolution, from those that have formed during the agony, or after death. M. Grisolle affirms, that those concretions, which are entirely yellow or white, elastic, consistent, fibrinous, and adherent, are never cadaveric. They must have formed a longer or shorter time before death.

Treatment.—As the diagnosis is so uncertain, the treatment must be so likewise. When detected, indeed, the affection can only be treated according to the symptoms that present themselves. There is no way whatever, of reaching the mischief. Alkalies have been advised, from their property of diminishing the tendency of the blood to coagulate, and the borate of soda has been considered, by Dr. Copland, the most effective agent in preventing the concretion of fibrin and in dissolving coagulable lymph: little or nothing can, however, be expected from them in the affection under consideration.

IX. ADIPOUS AND OTHER FORMATIONS IN THE SUBSTANCE OF THE HEART.

The heart is liable to many forms of morbid deposition, which will require a brief consideration only.

a. *Adipous formation, Degeneratio adiposa cordis, Steatosis cordis, Cardiethmoliposis,* and *Cardiomyoliposis* (Piorry); Ger. *Fettsucht des Herzens, Fettentartung des Herzens.*—It has been considered, that the tissue of the heart, in certain cases, becomes transformed into fat; but such is probably not the case; the fat appears to be infiltrated between the muscular fibres, so that, ultimately, they become atrophied, and so small, that the organ seems to be changed altogether into fat, and rupture may be the consequence. The heart, being deprived of its muscular energy, syncope is apt to occur, which may terminate fatally. The causes of this *vice* of nutrition is not known. It is most frequent in advanced life. Of 13 observed cases, two only were under 40; whilst 6 were upwards of 70. The influence of sex, too, is great. Amongst 35 males, M. Bizot found but four; whilst amongst 42 females there were not fewer than 23 affected with it; nor did this seem to be connected with the greater tendency of the female sex to obesity, for of the 42 females, 29 were quite emaciated; and of these last, 14 exhibited the disease, whilst amongst 30 emaciated men this was the case with only 3.

At times, in cases of sudden death, no morbid appearance has been perceptible, except an unusual deposition or surchage of fat towards the base of the heart. In these cases, should syncope occur,—owing to the weight of the fat, the heart may be unable to resume its action. There is no mode of diagnosticating this morbid condition.

b. *Fibrous Formation.*—As the fibrous tissue—*tissu jaune*—exists in the structure of the heart around the auriculoventricular and the arterial orifices, and in the valves, we can understand, that it may increase in size, so as to constitute a true hypertrophy, which may project, at times, internally, and, at others, externally into the pericardium.

c. *Cartilaginous and Osseous Formations.*—These formations do not frequently occur in the muscular structure of the heart; yet they are occasionally seen. The apex of the organ, and its whole substance, as well as the columnæ carneæ of the left ventricle, have been found converted into cartilage, and cartilaginous vegetations are not unfrequently seen on the valves. *Ossific depositions* are more common. They may take place in the cellular structure of the organ; in the fibrous tissue especially, by virtue of the great general law, that the fibrous tissue is the matrix of the osseous; in the chordæ tendineæ of the valves; in the valves themselves, and in the muscular fibres. They are more frequently met with in the left heart than in the right.

There are many cases recorded of partial ossification of the muscular substance of the heart, and some in which the ventricles have been found so completely changed, that they resembled the bones of the cranium. In these cases, the physical signs have not been observed; but the impediments to the circulation have been indicated by excessive dyspnœa; great anxiety; livid countenance; and other evidences of imperfect hæmatosis.

Where the transformation is seated in the endocardium, or at the orifices of the heart, the symptoms and signs will be those of narrowness of those apertures, described under the next section.

The causes of these transformations have been sought for in inflammation, which may, doubtless, act like other agencies that give rise to

a *vice* in nutrition; but inflammation would not seem to be necessary to occasion this. In old age, there is, perhaps, a natural tendency in the fibrous structures to become ossified; yet no one supposes, that this is the result of an inflammatory process.

d. *Tubercular Formation.*—This is extremely unfrequent, and as in the case of the intestines, when tubercles are met with in the heart, they are constantly found in other viscera.

e. *Scirrhous and Cancerous Formations.*—It is only necessary to remark, that these affections have not been noticed until after death; none of the evidences during life, having given rise to any suspicion of their existence. They may occur solitary, or in numbers. The same may be said of the

f. *Encephaloid Formation.*—This has been observed infiltrated between the muscular fibres, converting it into a yellow substance.

The different cancerous formations are more likely to occur after the age of virility; but there are cases in which scirrhus has been met with in infants.

g. *Melanotic Formations, Serous Cysts, and Hydatids.*—All these affections have been seen in the substance of the heart; but they are extremely uncommon. Not being able to diagnosticate their existence, it is unnecessary to dwell upon them.

X. DISEASES OF THE CARDIAC VALVES.

Diseases of the valves of the heart are by no means uncommon. Formed, in part, of the fibrous tissue, they are subject to ossification, whilst the endocardium that covers them is liable to vegetations. The most frequent formation is the osseous, especially in the valves of the left heart: it has been estimated, indeed, that nineteen-twentieths of valvular diseases are of this nature. This is probably too high an estimate, but there can be no doubt, that it is by far the most frequent lesion. The tricuspid valves, and the semilunar valves at the mouth of the pulmonary artery, are less frequently diseased than the mitral valves and the semilunar valves at the mouth of the aorta. Dr. Hope affirms, that in about 400 cases of valvular disease he had not, at the utmost, met with 20 cases of disease of the valves of the right side, which would only be 5 per cent., or 1 in 20. Dr. Clendenning has met with about 1 in 16, out of 100 cases, as exhibited in the following statement.

Valves of the left side, *alone*, . .	92·6	or $\frac{9}{10}$ths.
right side, *alone*, . .	2·1	or $\frac{1}{47}$th.
both sides, . . .	6·31	or $\frac{1}{16}$th.

He adds, however, that he neglected to record some instances, which might fairly be presumed to have occurred mainly, if not exclusively, under the first head. This would reduce his proportion below $\frac{1}{16}$th, and bring it nearer to Dr. Hope's. Dr. Hope adds, that he suspects, however, that it will eventually prove to be lower still.

Diagnosis.—Any disease about the valves must lead to impediment of circulation, and generally to narrowness, either of the auriculo-ventricular openings, or of the mouths of the pulmonary artery or aorta,—*Cardiostenosis.* In consequence of this, more effort is required

on the part of the muscular fibres of the parietes of the cavities, by whose contraction the blood is propelled onwards. When the hand is placed over the region of a heart thus diseased, the *frémissement cataire* or *purring of cat fremitus* is distinctly appreciated, and the same when the head or stethoscope is applied on the same region. The pulsations of the heart are usually very strong, especially under any mental or corporeal agitation; but the pulse, at the wrist, in place of being strong,—as it is under violent action of the heart, provided the blood can be freely sent into the arteries,—is, in these cases, small, hard, and unequal. It is generally, also, more or less irregular, and often intermittent. These are the symptoms, that may be expected from lesions of the valves of the left heart: the same *frémissement* is likewise observed, when the disease of the valves is in the right heart; but, in the latter case, for obvious reasons, the pulse is not implicated, and may be almost as in health.

It is not an easy matter to diagnosticate in what valves the lesions are situate. It is affirmed, that if a *bruit de râpe* or *rasping sound* be best heard near the apex of the heart during the dilatation of the ventricles, along with a *bruit de soufflet* or *bellows' sound*, we may infer, that the lesion is in the auriculoventricular valves;—the rasp sound being occasioned by the cartilaginous or ossific formations on the valves rubbing against each other; and the bellows' sound by the impediment to the free passage of the blood from the auricle into the ventricle; whilst if the rasp sound, and the *bruit de soufflet* be best heard over the base of the heart during the systole or contraction of the ventricles, we are justified in referring the lesion to the valves at the mouths of the aorta or pulmonary artery. It must be borne in mind, however, that whilst the auricles are dilating, the blood is falling back upon the valves at the mouths of the arteries; and that, on the other hand, whilst the ventricles contract, the auriculoventricular valves are rendered tense: hence, if a lesion—as insufficiency—exist in these last valves, the physical signs may be equally heard during the contraction of the ventricles; if in the semilunar valves at the mouths of the arteries, they may be heard during the dilatation of those cavities.

The following table by Dr. Bellingham, Physician to the St. Vincent's Hospital, Dublin, which is nearly similar to one given by M. Littré, will throw light on this matter.

AORTIC ORIFICE.

Contraction of orifice:—first sound morbid; second sound natural.
Insufficiency of valves:—first sound natural; second sound morbid.

LEFT AURICULOVENTRICULAR ORIFICE.

Contraction of orifice:—first sound natural; second sound morbid.
Insufficiency of valves:—first sound morbid; second sound natural.

It must be admitted, that the diagnosis of valvular disease is somewhat obscure, if we be guided by physical signs only. Dr. Graves, indeed, gives it as his opinion, that the functional derangements, produced by disease of any particular part of the heart, are seldom sufficiently characteristic to enable us to make out, whether the disease be situate in the auriculoventricular or in the semilunar valves; and

he owns, that it has frequently occurred to him, that all the symptoms supposed to be indicative of disease of the right side of the heart have been occasioned by disease of the left; and conversely. We can, however, have little hesitation, provided the signs above described are constant, with the concomitant symptoms of imperfect hæmatosis, as indicated by livid complexion, dyspnœa, and infiltration of the limbs, or augmented secretion of the fluid of the serous cavities, in deciding that such disease is present. Some observers place the greatest reliance on the physical signs as means of diagnosis, whilst others regard them as altogether uncertain. It has been even affirmed by distinguished observers, Messrs. Graves and Stokes, and in many of their affirmations, they are supported by MM. Chomel, Piorry, Grisolle, and others—1. That the physical signs of valvular disease are not fully established; 2. That, taken alone, they are in no case sufficient for diagnosis; 3. That even in organic disease the nature and situation of murmurs may vary in the course of a few days; 4. That all varieties of valvular murmurs may occur without organic disease; and 5. That organic disease of the valves may exist to a very great degree without any murmur whatsoever.

The bellows' sound, the author can say from experience, is an uncertain sign; but still it affords a presumption, that the calibre of the vessel, through which the blood has to flow, is diminished. We can induce it artificially, by pressing upon a large vessel. The rasp sound the author has occasionally heard when the appearances on dissection have not been such as to account for it satisfactorily; but still, if we have these physical signs co-existing with the symptoms described above, we may generally regard the case as one of valvular disease, in which there is some formation that diminishes the capacity of the outlet, and occasions a rubbing sound when the valves are opened or closed. The physical signs are, however inadequate to point out, in all cases, whether the valves of the right or left heart be affected.

The author has been induced to infer, that where a rough sound accompanies the second sound of the heart, it is not always owing to a morbid condition of the semilunar valves; but to the refluent blood passing over the lining membrane of the aorta roughened by ossific deposits.

When the auriculoventricular valves are diseased, it happens occasionally, that they are united, by adhesive inflammation, to the side of the heart, as the semilunar valves may be to the aorta or pulmonary artery when they are diseased. If we be right as to the mode in which the second sound of the heart is produced,—should this phenomenon happen to the semilunar valves, the closure of the valves during the dilatation of the ventricles must be incomplete; and, consequently, the second sound be interfered with. Absence or indistinctness of the second sound would consequently lead to the belief, that the semilunar valves do not close perfectly;—and this view would be encouraged if the action of the ventricle were more forcible than natural; as a greater effort might be expected on the part of the ventricle to send back the blood, which reflowed from the artery, along with that arriving at it from the auricles.

Owing to insufficiency of the tricuspid valves, some degree of regurgitation, generally perhaps, if not always, occurs. Lesions of these valves are very unusual, and almost always slight. They are rarely so much diseased as to yield a murmur on auscultation. Regurgitation through the mitral valve is the result of disease; and it is attended by a murmur synchronous with the impulse and first sound, which is produced by the blood being thrown back through the imperfectly closed valve when the ventricle contracts. "The character of mitral murmurs," says Dr. C. J. B. Williams, "is generally blowing, but sometimes passing into a whistle, and more rarely grating. In some cases, it accompanies the whole systolic act, and terminates with the second sound: in others it is confined to the end of the first sound, giving to it an additional vowel or roughness, as we may express by the words *loo-dup* or *lurr-dup;* or, if confined to the beginning, *rehub-dup* or *jub-dup*."

Various conditions of the valves may give occasion to regurgitation: they may be ossified or cartilaginous: vegetations may exist upon them: they may be unusually thin and perforated in various places, a marked case of which the author has seen lately; or a portion of the valve may have contracted adhesion to the neighbouring parts; but, as Dr. Hope has remarked, perhaps the most common cause of all is shortening, usually with thickening, of the chordæ tendineæ, which prevents the valve from closing. M. A. Fauvel has concluded from observed cases, that an abnormous presystolic *bruit*, localized towards the apex of the heart is, in the present state of knowledge, the most probable stethoscopic sign of narrowness of the left auriculoventricular orifice. He admits, however, that this requires to be sanctioned by fresh observations.

Pathological Characters.—These are various. Ossific deposits of divers forms and sizes may be found occupying the whole, or only a part, of the valves; and these may be situate upon or under the prolongation of the endocardium, which forms their inner coat. In all cases, the conformation of the valves is altered, and their functions more or less interfered with. The same may be said of the cartilaginous and fibrous formations: these exhibit a dense, yellowish-white tissue, also of various shapes and sizes. In other cases, fleshy vegetations are found commonly occupying the free edge of the valves, and having, at times, the appearance of warts: they are usually round and rough, and of a bluish or red colour. At times, they resemble small cysts, and are most commonly found on the aortic or mitral valves.

Treatment.—This must be chiefly palliative and hygienic: too great polyæmia must be avoided, and everything that can unduly excite the sanguiferous system. We know of no remedy which can act on the morbid formations themselves.

XI. CYANOSIS.

Synon. Kyanosis, Cærulosis, Cyanopathia, Morbus cæruleus, Cyanosis cardiaca, Blue disease; *Fr.* Cyanopathie, Maladie bleue; *Ger.* Blaue Krankheit, Blausucht, Kyanose.

Immediately after birth, the blood, which had passed in part through the foramen ovale, from the right into the left auricle, and that which

had passed through the pulmonary artery into the aorta through the ductus arteriosus, are solicited in another direction, and proceed through the pulmonary artery to the lungs. Should, however, any malformation exist, such as narrowness of the pulmonary artery, the blood may still continue to pass in part from the right side of the heart to the left, and those parts of the body which are covered by a thin cuticle—as the lips—may exhibit that an imperfectly oxygenized blood is circulating through the system. Still, it may be a question, whether the blueness be not altogether owing to impeded return of blood to the heart rather than to admixture of the two bloods through the foramen ovale. This livid or blue colour has given rise to the various names, commonly assigned to the affection of the heart under consideration.

Diagnosis.—The colour of the skin and mucous membranes is livid, blue, or purple, and this usually from the time of birth. More or less dyspnœa is generally present, especially on exertion, with palpitations and occasional syncope; the general heat of the body is diminished, and there is unusual susceptibility to cold.

The affection is generally connected with a patulous state of the foramen ovale from birth: but there have been cases in which, after having been closed, it has been reopened. When the pulmonary artery is properly formed, however, there may be no cyanosis, even when the foramen ovale has remained open. A case has been recorded, by Mr. H. J. Johnson, of a woman, who was admitted into St. George's Hospital, London, with intractable ulceration of the leg. Her complexion was remarkably dingy, but not blue. She died of erysipelas, and on examining the body, the foramen ovale was found so open that two fingers could be passed from one auricle to the other. Mr. Johnson thinks, and probably correctly, that an open condition of the foramen ovale is of no serious consequence, unless it is accompanied by some malformation; and a similar view has been urged by Dr. West, before the Pathological Society of Philadelphia, (October 31st, 1842); by Dr. Moreton Stillé, of Philadelphia, by Dr. Norman Chevers, of London, by Dr. Craigie, in the Edinburgh Medical and Surgical Journal for October, 1843, and by M. Valleix. The case of a woman, aged 57, has been recorded by Dr. Mayo, who had been the subject of chronic bronchitis, accompanied by sudden accesses of dyspnœa, small pulse, increased cardiac impulse, and dulness, with a loud systolic *bruit* at the apex of the heart. The foramen ovale was found open to the extent of an inch and a quarter. Dr. Woodhouse exhibited to the Reading Pathological Society, (England,) a heart taken from a woman aged 71, who died of apoplexy. The foramen ovale was patulous to a considerable extent,—about half an inch, and the valvular portion of the septum auriculorum was unusually large; yet there were no phenomena during life—as lividity of countenance, defective nutrition, &c., to indicate the existence of such a condition;—and, more recently, the author brought before the Clinical Class, at the Philadelphia Hospital, the heart of a coloured female, aged 98 years, the opening in the foramen ovale of which permitted the little finger to pass readily through. This had evidently been congenital; and yet no inconve-

nience whatever was produced by it. The case is detailed in a report of the Clinical Lecture, published in the Philadelphia Medical Examiner for July, 1845; and a case of great hypertrophy of the heart and open foramen ovale, without cyanosis, in a child 4½ months old, is reported in the same Journal for June 15, 1844, by Drs. J. D. White, and James Bryan, of Philadelphia.

It is perfectly obvious, then, that a patulous state of the foramen ovale after birth is not of itself sufficient to occasion cyanosis. There can be little or no difference between its condition and that of the ductus arteriosus immediately before and for some time after birth. Nay—as elsewhere shown, (*Human Physiology*, 6th edit., ii. p. 554, Philad., 1846,) —the foramen ovale remains open, to a certain degree, for many days and may do so even for weeks; and yet from the first moment after the establishment of respiration, there is no cyanosis. Moreover, as Professor Fouquier has remarked, the fœtus is not *cyanosed*, although the two bloods are mixed in it. An open state of the foramen would seem, indeed, to be much more common than is generally imagined. In 34 subjects, from one to fifteen years of age, M. Bizot found it open, eleven times; in 58, from fifteen to thirty-nine, eighteen times; and in 63, from forty to ninety years of age, fourteen times.

Dr. Craigie states, that he is satisfied from a case related by him in the Journal referred to, as well as from several others; *first*, that the open state of the foramen ovale is rarely a primary and solitary lesion; *secondly*, that when it is a solitary lesion it is not injurious, and the venous blood of the right auricle is not thereby necessarily mixed with the arterial blood of the left auricle; and *thirdly*, that in opposition to what has been hitherto usually taught, the open state of the foramen ovale is in a large proportion of cases the means of prolonging life; an imperfectly oxygenized blood being adequate to maintain vital action. (See Asphyxia.) He is, moreover, disposed to infer, from various facts in the history of the development of the ovum, that the obstructed, or, it may be, the undeveloped state of the pulmonary artery, is the anatomical cause of the perforated septum often observed in cases of cyanosis, and of the origin of the aorta from the two ventricles, when that malformation is observed.

Cyanosis, again, may be present, when there is no communication between the two sides of the heart. Anything, indeed, that interferes with the return of the blood to the heart, and prevents hæmatosis, may be the cause of the blueness of the surface, and especially of the mucous membranes; or, to use the language of Dr. Moreton Stillé, cyanosis "depends simply upon any cause which, acting at the centre of the circulation, will produce a stasis of venous blood in the capillary system." Still, we cannot incur much risk in diagnosticating a communication between the right and left side of the heart, if, along with blueness from birth, we have the indications of cardiac disease laid down above.

Pathological Characters.—The appearances, found on the dissection of those who have died of cyanosis, are various. The lesions, presented on the dissection of 53 cases, have been recorded by M. Gintrac. In 22 of these, the aorta was found to arise from both ventricles. In

33, the foramen ovale was open; in 14, the ductus arteriosus was wanting; in 4, the heart was single, consisting of one auricle and one ventricle; in 5, the ventricular septum was imperfect; in 22, the pulmonary artery was contracted; in 5, that vessel was obliterated; in 1, the aorta was obliterated; and in 4, the aorta arose from the right ventricle,—the pulmonary artery from the left.

The various *Malformations of the heart* have been well investigated by different pathological writers, and especially by Meckel and Hope, and more recently still by Warnatz, of Dresden, who has described them with special reference to cyanosis. The various malformations given by the second of these writers, are as follows:—1. The heart single, like that of a fish, consisting of one auricle and one ventricle, from which a trunk originates, that presently divides into pulmonary artery and aorta. 2. Two auricles and one ventricle. In one case, the patient attained the age of 22. 3. The foramen ovale remaining open, which is the most common malformation. 4. The foramen ovale and ductus arteriosus both remaining open. 5. The foramen ovale and ductus arteriosus open, and the pulmonary artery obliterated at its origin. In one case, the cavity of the right ventricle was nearly obliterated, and in two others, the septum of the ventricles was perforated. 6. Ventricular septum deficient; auricular imperfect. 7. Ventricular septum deficient at the aortic orifice, so as to leave a common opening into that vessel from both ventricles; this malformation being generally accompanied by contraction of the pulmonary artery, frequently by an open state of the foramen ovale, and occasionally by obliteration of the pulmonary artery and patescence of the ductus arteriosus. 8. Ventricular septum separated, perforated towards the base, associated with contraction of the pulmonary artery and patescence of the base. 9. Foramen ovale open; pulmonary artery arising from both ventricles, and giving off the descending aorta, whilst the ascending aorta arises in the usual way. 10. Aorta arising from the right ventricle, and the pulmonary artery from the left; the foramen ovale, and sometimes the ductus arteriosus, remaining open. An interesting case of this kind has been described by Dr. Walshe: the child lived ten months. 11. The right auricle opening into the left ventricle instead of into the right, and the ventricles communicating by an aperture immediately below the aortic valves. The foramen ovale open. In a case of cyanosis, communicated to the author by Dr. Rohrer, of Philadelphia, the heart appeared to resemble that of the higher reptiles —the ophidian, saurian and chelonian, which consists of two auricles, with a partitioned ventricle, or a single ventricle. Of this variety of malformation, many examples are on record; but although these cases greatly resembled each other in the fact of a ready communication existing between the ventricles, they differed greatly in the details. In one case, the aorta arose from the ordinary place in the left ventricle, which was more than usually developed: at the same time, there was an opening through the septum ventriculorum in a straight line with the embouchure of the aorta, which permitted a free communication between the right and the left ventricle, in such sort, that one half of the aorta might be considered to open into the right, and the other into

the left ventricle. The pulmonary artery was greatly diminished in size. in another case, besides hypertrophy of the heart, a communication existed between the right ventricle and the aorta, at the place where the pulmonary artery ought to have been, and at the same time the carotid arose from the left ventricle. In another case of a blue child, but a slight trace existed of the septum ventriculorum; the valve of the foramen ovale, which was open, and the Eustachian valve were present; and the ductus arteriosus was divided into two branches, one of which went to the right, and the other to the left lung, from the aorta; the pulmonary artery was wholly wanting. Generally, the pulmonary artery has been found of very small size. MM. Duret and Caillot not only found the mouth of the pulmonary artery very narrow, and the coats thinner than usual, but the artery itself entirely impervious and the ductus arteriosus wholly obliterated. In another case, recorded by Dr. Ramsbotham, the pulmonary artery was found wanting; its place appearing to have been supplied by the bronchial arteries. In a case of cyanosis, described by M. Romberg, the aorta, near the heart, terminated in a *cul-de-sac*. It had received its blood through the ductus arteriosus from the pulmonary artery, which was of unusual size; the child lived four days; and in one case already referred to, on the authority of Dr. Craigie, the cyanosis was connected with mutual adhesion of the semilunar valves of the pulmonary artery. Many of these cases show, that the nutrition of different parts may go on well, even when a small quantity only of oxygenized blood is distributed to them, provided only, that the deficiency has existed, as it necessarily does, in such cases, from birth.

Treatment.—No special medical treatment can be of any advantage. The case must be managed in the same manner as the other chronic heart diseases, which have been described. Commonly, in the cyanosis which is congenital, death takes place in the first few years; and it rarely happens, that the patient survives the age of puberty. He more readily falls a victim to any severe attack of disease, than one whose conformation is normal. In the cyanosis of the new-born—*cyanosis neonatorum*—Professor Meigs lays great stress upon the effect of position. He recommends, that the child should be placed upon its right side, with its head and shoulders inclined upwards upon pillows, and be kept in this position for hours. "Upon placing the child thus, its septum auriculorum becomes a horizontal plane, supporting the blood in the left auricle. The weight of that blood presses the valve of the foramen ovale into coincidence with the plane of the septum, and closes the patulous orifice. The succeeding injections of blood take their proper route to the lungs and the system, so that a few acts of the respiratory muscles give sufficient doses of oxygen to the blood to diminish, and to rapidly remove, the excess of carbon, and the child is cured." Rest, is doubtless an important agent in many of these cases in establishing the circulation properly; but, on the other hand, a smart blow on the breech not unfrequently effects the object more speedily. The necessity for well oxygenated blood is not, indeed, so great in the new-born as it is afterwards. Throughout the whole period of utero-gestation, there is but little apparent difference

between the arterial and venous blood of the fœtus; and the real difference cannot be by any means so great as in the adult. The new-born child can, therefore, continue to exist when hæmatosis is imperfectly exercised by the lungs; and, accordingly, we never hesitate—in practising artificial insufflation of the lungs in cases of asphyxia—to send in air from the lungs of the adult, which has lost a portion of its oxygen, and become charged with an equal amount of carbonic acid. The blow upon the breech acts upon the peripheral extremities of the nerves, and through them on the nervous centres, the torpor of which is the cause of the non-performance of respiration, rather than the circulation of black blood in the arterial vessels.

Where the cyanosis is owing to positive malformation, no agency will be of any permanent advantage.

XII. PALPITATION.

Synon. Clonus palpitatio, Palmus, Palpitatio cordis, Cardiopalmus, Cardiogmus, Tremor cordis, Nervous palpitation. *Ger.* Herzklopfen, Nervöse Herzpalpitationen.

Under this term are meant those palpitations only, which are purely nervous. Such as are connected with various organic diseases of the heart have been referred to already.

The effect of mental emotions on the action of the heart is well known. Although the contractions of the organ appear not to be dependent upon the action of the brain or spinal marrow, or of both, there is no doubt of the rapidity of the contractions being greatly influenced by the passions, and, consequently, by the encephalon. It can readily, therefore, be understood, that, in unusually impressible persons, palpitations may be induced on slight causes; and, accordingly, it is often a neuropathic phenomenon, and a frequent concomitant of hysteria.

Diagnosis.—When we examine a patient, whilst labouring under palpitation, which is, notwithstanding, unquestionably nervous, it is impossible, at times, to decide as to the condition of the heart. There may, indeed, be the usual evidences of various organic diseases of the viscus. After the palpitations have passed away, auscultation may aid us; and if no abnormous sound be rendered, and the dyspnœa end with the paroxysm of palpitations, we can have little doubt that the affection is neuropathic. The history of the case will, also, throw considerable light on the matter; and if the palpitations be nervous, the patient, as suggested by M. Andral, will probably be able, in the intervals between them, to endure more severe exercise than if organic disease were present.

Causes.—It has been already remarked, that mental emotions are common causes. Whatever, indeed, adds to the impressibility of the nervous system may act as a predisposition, and under such circumstances, slight exciting influences are sufficient to develope them. The inordinate use of tobacco, excessive fatigue and exhaustion—no matter how induced—and anæmia are, in this way, concerned in the causation. They accompany dyspepsia, and hysteria,—diseases in which the impressibility in question is largely developed.

In some cases, the affection would seem to have been induced by polyæmia or fulness of blood; but this, we apprehend, is a rare event.

Treatment.—This is essentially that recommended for hysteria. If fulness of blood exist, bloodletting, either general or local, may be demanded. Commonly, however, the palpitations yield to rest, and the employment of agents, which induce a new action in the nervous system,—as the various substances considered to be direct antispasmodics, all of which, however, act by virtue of the new impression they exert on the gustatory nerves, and on the nerves of the stomach, thus detracting from the nervous erethism directed towards the heart. It is in this way, and in this only—in all probability—that leeching, cupping, and blistering the region of the spine, produce their good effects, not only in nervous palpitations, but in hysteria.

The indications laid down under hysteria, and the mode of carrying them into effect, may, indeed, be transferred, without change, to the affection now under consideration, when it is purely nervous.

When the palpitations are accompanied by energy of contraction of the ventricles, digitalis may be administered either alone or in combination.

℞.—Tinct. digital. gtt. x.
—— hyoscyam. gtt. xv.
Acid. hydrocyan. gtt. j.
Aquæ camphor. f℥j.—M. et fiat haustus ter die sumendus.

In all cases, it is important to inquire into the pathological cause of the palpitation, and to adapt the system of medication accordingly. There is always more or less alarm, which must be allayed, where it can be done, by assuring the patient of the absence of organic disease, as the mental agitation cannot fail to react on the heart, and aggravate the palpitation.

Not unfrequently we meet with cases of irregularity of the heart's action,—especially of the rhythm,—which appears to be greatly dependent upon a want of nervous power generally, and of the nerves distributed to the heart especially. Auscultation may here exhibit no evidence of valvular derangement, or of altered nutrition of the organ; but a loss of beat is observed occasionally at the wrist, whilst at the same time the impulse of the heart may be exaggerated. This pathological condition is often accompanied by languor, and by irregularity of calorification,—the hands and feet being kept warm with difficulty; and occasionally, immediately after the irregularity of the heart's action is felt in the epigastrium, the patient breaks out into a profuse perspiration. Along with these phenomena, he is affected with flatulence of the stomach and bowels; and, in many cases, the anomalous symptoms are present, which have been described as characterizing Torpor of the Colon. (q. v.)

The treatment ought to consist of agents that are calculated to obviate debility and erethism. The preparations of iron in full doses are of great service; and a glass or two of wine at dinner, or half a pint of porter or of ale, with animal food in proper quantity, has afforded essential relief.

XIII. SYNCOPE.

Synon. Leipopsychia, Apsychia, Apopsychia, Leipothymia, Asphyxia, Animi defectio, A. deliquium, Swoon, Fainting fit; *Fr.* Evanouissement, Défaillance; *Ger.* Ohnmacht.

Syncope or fainting is a state of suspended animation from causes connected with the heart's action. It is to this condition, that the term asphyxia, which—as elsewhere seen—means *pulselessness*, is most appropriate; but, of late years more especially, the term has been applied to suspended animation, owing to an arrest of the respiratory function. (See Asphyxia.)

In many affections of the heart, syncope is an important, and often a most serious symptom; but there are numerous cases, as in impressible females, in which it occurs independently of any such morbid condition of the heart, and is of little consequence.

Diagnosis.—Complete syncope rarely takes place at once. Usually, a sense of faintness or deadly sickness is experienced, with more or less dimness of vision and tinnitus aurium, accompanied by a sense of coldness and tingling in the lower extremities, cold perspirations, and deadly paleness. These may exist for a longer or shorter period, when the individual falls down, the pulse and respiration cease momentarily, or are imperfectly accomplished, and all consciousness is lost. If the ear be placed on the chest at this time, the contractions of the heart are found to be exceedingly feeble,—the first sound being greatly diminished in intensity, and the second commonly inaudible. Generally, the functions are re-established in the course of a few seconds, so that the practitioner, when sent for, finds the patient recovered. At times, however, the syncope continues for a long period; and the recorded cases of *trance*, said to resemble death closely, are probably examples of this affection.

Occasionally, as the patient recovers and the blood is re-distributed to the capillaries, there is more or less confusion of intellect, vertigo, and headache; and, often, feelings that are described as extremely disagreeable and even painful, so that, in those who are liable to syncope, the *coming to* is at times more dreaded than the precursory symptoms. In recovery from an attack of syncope, it is the spinal nervous system of which the activity is first renewed: the respiratory movements recommence, and the power of deglutition is restored, before voluntary movements are executed.

Syncope is an event to be feared, where the heart is diseased; and not unfrequently it is the immediate cause of death in such cases. Embarrassment of circulation occurs; the heart ceases its action, and, owing to the morbid condition, its functions cannot be resumed. In ordinary cases, however, fainting is attended with little or no immediate danger.

Cases of sudden death, originating from cessation of the heart's action without any obvious cause, have been described by Mr. Chevalier under the name *asphyxia idiopathica*.

Causes.—Unquestionably, a predisposition to syncope may be afforded by organization. Impressible persons are far more liable to it, and hence it is so much more frequent with females than males. When

the system is reduced in any manner, as from profuse evacuations of any kind, or from protracted illness, a similar predisposition is induced. Under such circumstances, any unusual impression made on the nervous system, as rising suddenly in bed, or a strong mental emotion, may bring on an attack. In very impressible individuals, peculiar odours, or the sight of disagreeable or disgusting objects, mental emotions, corporeal suffering, slight fatigue or fasting, may act as exciting causes; and, in any person, long continuance in the erect attitude, and especially with the hands raised over the head, so as to require greater exertion on the part of the heart to propel the blood, may induce it. A distinguished teacher, Dr. James Gregory of Edinburgh, was in the habit of stating, that he had succeeded in causing it at will in this manner, but he desisted under the well-grounded apprehension that he might lay the foundation for serious cardiac disease. The tendency of an elevated temperature,—as in crowded rooms, or by standing with the back to the fire,—to induce fainting is well known.

In all cases, the circulation is rendered irregular before it is arrested; but, perhaps in all, such irregularity is induced by a modified condition of the nervous system. Certainly, most, if not all, of the causes, enumerated above, would seem to exert their influence primarily on the nerves.

Treatment.—As before remarked,—in an ordinary case of syncope, the practitioner has rarely an opportunity for exercising his skill. In favourable cases, he finds the functions restored before his arrival; and, in unfavourable cases, the state of suspended animation may have terminated in positive death. The syncope, that supervenes on bloodletting, on surgical operations, and uterine hemorrhage, or the discharge of morbid accumulations of fluid, where proper pressure has not been made, is that which he is chiefly called upon to treat.

In a case of simple syncope, it is generally but necessary to place the patient in the horizontal posture, in order to favour the re-distribution of the blood from the heart; to loosen all tight clothes; to expose him to a draught of cold air; and to arouse directly the peripheral nerves, and indirectly the nervous centres, by sprinkling cold water over the face, and holding excitants—as ammonia—to the nostrils. When the patient is able to swallow, a little cold water may be given, to which may be added twenty or thirty drops of hartshorn, or sal volatile—the *spiritus ammoniæ aromaticus* of the Pharmacopœia of the United States,—a teaspoonful of the *spiritus ætheris sulphurici compositus*, or of the *spiritus ætheris nitrici*, or a little sulphuric ether itself, or brandy, or wine. In more prolonged cases, it may be advisable, in addition to these means, to employ turpentine injections, and hot applications to the epigastric region. In the faintness that ensues on copious uterine hemorrhage, it is sometimes requisite to administer the most powerful stimulants—as brandy—with great freedom; and, in cases of prolonged suspended animation that simulate death, like those that are on record, it might be considered proper to apply heat, in the form of the moxa, of a drop of boiling water let fall on the epigastrium

or the back, or by dipping a case-knife in hot water, and applying it to the same parts.

It may be well to remark, that during the existence of chronic heart disease, should symptoms occur to suggest blood-letting, it ought to be practised with great caution, and should never be carried to such an extent as to induce syncope. The author saw one case in which the syncope was fatal; and many such have occurred. In aged individuals, the syncope caused by blood-letting is frequently protracted and alarming.

Where the person is liable to faint, attention must be paid to the removal of the remote causes. As these generally consist in unusual nervous impressibility, the means, elsewhere inculcated for the removal of such a condition, must be recommended; and especially all mental and corporeal agitation should be sedulously avoided. Certain cases of syncope would seem to be connected with a plethoric condition; but this must be uncommon. The mode of treatment, in such cases, will be obvious.

XIV. ANGINA PECTORIS.

Synon. Sternalgia, Syncope anginosa, Asthma dolorificum, A. convulsivum, A. arthriticum, A. spastico-arthriticum, A. diaphragmaticum, Orthopnœa cardiaca, Stenocardia, Sternodynia syncopalis, Cardioneuralgia, Neuralgia brachio-thoracica, Hyperæsthesia plexus cardiaci, Suffocative Breastpang, Neuralgia of the heart; *Fr.* Angine de Poitrine, Névrose du cœur; *Ger.* Brustbräune, Herzklemme, Neuralgie des Herzens.

Much difference of sentiment has existed in regard to the character of the disease known under this name. By many writers, it has been ascribed to disease of the heart, as spasm, accumulation of fat, polypous concretions, ossification of the coronary arteries, or disease of the valves; whilst others have considered it to be a spasm of the diaphragm and other muscles of respiration. Dr. Good thinks, that both may probably be regarded as causes in different instances; for, that the heart is not always affected is clear, he conceives, from the frequent regularity of the pulse through the entire paroxysm. This argument is not, however, conclusive. In many cases of serious heart affections, the rhythm of the pulse remains unmodified.

By an eminent pathologist, M. Andral, angina pectoris has been ranked among "lesions of the sensibility of the heart;" whilst another, M. Laënnec, is of opinion, that although it may be accidentally associated with diseases of the heart, it does not necessarily depend upon them. The opinion, that the aggregate of symptoms, known under this name, is primarily referable to the heart, seems, however, to be the most accurate.

Diagnosis.—Angina pectoris consists essentially of a violent sense of constriction and pain across the chest, extending along the neck, shoulder, and arm, with great distress and sense of suffocation,—these symptoms recurring in paroxysms, and at uncertain intervals. The first attack of the disease is, at times, sudden—commonly so, indeed,—and takes place when the person is ascending a staircase, or going up hill; he is arrested by an excessively lancinating and constrictive pain, which causes him to stop. This pain, which is in the region of the heart, generally ceases soon, and leaves the individual nearly in

his accustomed health. At first, the interval may be considerable, but, subsequently, the paroxysms become more frequent, and are brought on by slighter and slighter exciting causes,—the most trifling mental uneasiness giving rise to them. Their approach may be indicated by yawning and a sense of heat in the chest. In very bad cases, the paroxysms occur several times in the course of the day, and the pain shoots to the neck, and along both upper extremities, especially the left, as far even as the fingers. The patient is under constant apprehension of impending dissolution: this sooner or later happens, for the prognosis is always unfavourable, death taking place very suddenly, at times, in one of the paroxysms;—at others, fatal syncope occurring when least expected, and when the person may be under no unusual mental or corporeal excitement.

Even in the midst of the paroxysm, the patient can usually take a full inspiration. He avoids doing so, however, in consequence of the increase of the pain, and generally compresses his chest, and avoids every kind of movement. The contractions of the heart are feeble; and, although palpitations are commonly enumerated amongst the many anomalous symptoms of this singular affection, they are not often perhaps present, unless there is some complication of organic disease of the heart along with the angina. In the paroxysm, the patient's whole appearance indicates intense anguish; the face is pale; and the extremities are cold, and covered with a clammy perspiration.

The disease may be confounded with different organic affections of the heart and thorax. These must be diagnosticated, between the paroxysms, by their appropriate characteristics.

Angina pectoris is the disease which is considered to have proved fatal to the celebrated John Hunter; but in his case there were strange symptoms. He presented one of the most singular examples on record of suspension of two of the most important of the vital functions. (See the author's *Human Physiology*, 6th edit. ii. p. 680, Philad. 1846.) In the year 1769, being then forty-one years of age, of a sound constitution, and subject to no disease, except a casual fit of the gout, he was suddenly attacked with a pain in the stomach, which was speedily succeeded by a total suspension of the action of the heart and of the lungs. By a violent exertion of the will, he occasionally inflated the lungs; but over the heart he had no control whatever. In about three quarters of an hour, however, the vital actions began to return of their own accord, and, in two hours, he was perfectly recovered. During the whole attack, sensation, thinking, and volition were perfect, and all the voluntary actions were executed with as much strength as ever.

Causes.—Angina pectoris seems to belong to no particular climate or season. Foundation for it would appear to have been laid by gout and rheumatism. The immediate causes are great muscular exertion —as walking rapidly up stairs or up any ascent; and, indeed, great muscular exertion of any kind; violent mental emotions, under which the individual may die suddenly, as was the case with Mr. Hunter.

Whatever inordinately excites the action of the heart cannot fail to act as an immediate cause of the paroxysms.

The following synoptical view of certain statistical details in regard to the disease has been given by Dr. Forbes as convenient for reference. The eighty-eight cases were recorded by different authors; and they show a very large preponderance of males. Dr. Forbes, however, remarks, that it is necessary to make some allowance for circumstances connected with them, before they can be received as grounds for fixing the statistics of the disease, taken without reference to its degree of severity. The truth, he thinks, would seem to be, "that of the more severe cases, particularly such as depend upon organic disease of the heart and large vessels, the great majority occur in the male sex; whilst of milder cases, a very considerable proportion, perhaps an equal proportion, are met with in females, and at an earlier period of life." This, Dr. Forbes says, is the result of his experience, as well as that of others.

A. *Results relative to the sex of the patients.*

Total number of cases examined		88
Of these were, men	80	
women	8	

B. *Results relative to the age of the patients.*

Total number whose ages are recorded		84
Of these were, above fifty	72	
under fifty	12	

C. *Results relative to the results of the cases generally.*

Total number of patients, the event of whose cases is recorded		64
Of these there died (almost all suddenly)	49	
Were relieved or recovered	15	

D. *Results relative to the event of the cases as regards sex.*

1. Total number of fatal cases		49
Of these were, men	47	
women	2	
2. Total number of cases cured or relieved		15
Of these were, men	11	
women	4	

Pathological Characters.—There seem to be none that can be esteemed special. The disease has been supposed by Dr. Parry to be dependent upon ossification of the coronary arteries of the heart; and this condition would appear to have been met with in the generality of cases; yet it is often absent when the symptoms of angina pectoris are well marked, and on the other hand is present when they do not exist.

Various morbid appearances have been seen about the valves of the heart; adhesions of the pericardium to the organ; depositions of fat around the viscus and large vessels, &c. &c.; yet, each and all of these appearances have been found in other affections of the heart. The very nature of the disease is, indeed,—as already remarked,—a matter of dispute. To us it would seem to be seated in the nervous plexus distributed to the heart, and to be, therefore, essentially nervous. Certainly, those remedies would appear to have been most successful in the paroxysms, that act by inducing a new nervous impression. Various lesions have, doubtless, been observed on the dissection of

those who have died under symptoms of angina pectoris, but it is by no means established, that these were more than complications, or concomitants. In Mr. Hunter's case, for example, the pericardium was usually thickened; the heart itself was small, appearing too little for the cavity in which it was contained, its diminished size being the result of atrophy or wasting. The muscular structure of the organ was pale, and of loose texture; the coronary arteries had their branches converted into long tubes, which were with difficulty divisible by the knife; and the mitral valves were much ossified. These were the main appearances. But Mr. Hunter died in his sixty-fifth year, an age at which cardiac lesions are not uncommon. Which of these appearances, or whether any, were connected with the symptoms of angina pectoris, remains a question.

On highly respectable authority, that of Professor Hosack of New York, and of Dr. Forbes, the disease has been supposed to consist in a plethoric condition, more especially of the heart and great vessels. Dr. Forbes argues, that its seat is in the heart, as well from the frequency of sudden death in the paroxysm, for which derangement of no other thoracic or abdominal organ would adequately account, as from the unquestionable frequency with which cardiac lesions are found in those who have died of it. These lesions, however, are not considered its immediate or essential cause: this, it is conceived, is more probably some unusual irritability of the nerves of the organ.

It has been affirmed by Dr. Corrigan, that several of the symptoms, which are considered to indicate the existence of angina pectoris,—such as paroxysms of dyspnœa induced by exercise, a sense of tearing asunder within the chest, together with anxiety and mental distress, may originate in aortitis or inflammation of the mouth of the aorta, which will occasionally yield, even when of rather long standing, to leeching, counter-irritation, and a mild mercurial course. It is probable, however, as elsewhere remarked, (see Inflammation of Arteries,) that the aortitis is, in such cases, a mere complication.

In 39 recorded cases of death from angina pectoris, referred to by Dr. Forbes, the following were the morbid appearances met with.

Organic disease of the heart alone	10 times.
Organic disease of aorta alone	3 "
Organic disease of the coronary arteries alone	1 "
Ossification of the coronary arteries	16 "
Ossification or other disease of the valves	16 "
Disease of the aorta	24 "
Preternatural softness of the heart	12 "

Treatment.—This must be essentially palliative. If errors in diet seem to be the cause of a paroxysm, an emetic may be administered. Revellents over the cardiac region have been serviceable. Whatever, indeed, excites a new impression is indicated; hence it is, that magnetism, applied in the form of two strongly magnetised steel plates,—the one to the left præcordial region, and the other exactly opposite, on the back, in such manner that the magnetic current shall traverse the affected part,—has been found serviceable; more so, indeed, it has been affirmed by M. Laënnec, than any other agent, both in relieving the paroxysm and in warding it off. When the magnet has afforded but

little relief, a good effect, according to Laënnec, has followed the application of a small blister under the anterior plate. Dr. Hope, however, states, that they, who witnessed the application of the magnet by Laënnec, did not, in general, form so favourable an opinion of its utility as he did. It appeared to be more successful when combined with acupuncture. Its effects are doubtless altogether revellent.

Large doses of opium have also been advised, and they will doubtless be often highly valuable, as in other neuralgic affections; but to afford any great benefit they must be full. In Mr. Hunter's case, opiates are said to have aggravated the symptoms, but they were administered in small doses, which could scarcely fail to be injurious. At least two or three grains of soft opium should be given in the form of pill, or a full dose of the *tinctura opii*, associated with remedies that make a new impression on the gustatory nerves and on the nerves of the stomach.

R.—Tinct. opii.
—— asafœtid. āā. f℥j.
Aquæ camph. f℥x. f. haustus.
To be repeated every half hour, if necessary.

All the remedies, indeed, advised in nervous palpitation, would appear to be indicated in angina pectoris.

In stout plethoric individuals, advantage has been found from the cautious use of the lancet, which unloads the heart and great vessels, and enables them to react freely on their contents. In dubious cases, recourse may be had to cupping or leeches; or, after the leeches have fallen off, cups may be placed over the leech-bites. In this way, we have a joint depleting and revellent operation.

After the paroxysm has passed off, great attention should be paid to prevent a recurrence. This must consist in avoiding the exciting causes. The diet should be carefully regulated, so that it be neither excitant by quantity nor quality. It should consist of food easy of digestion; the bowels should be kept in a regular state; and it can only be in this way that sulphur, recommended of late, (℥ss.—℥j. once or twice daily,) can be of service. Every physical and moral excitement, that could occasion an increased afflux of blood to the heart, should be carefully avoided. Mental emotions—being the most frequent of the excitant influences—must be scrupulously guarded against.

It need scarcely be said, that if, in the intervals, phenomena exist, which indicate that there is organic disease of the heart, they must be met by the directions given under such disease. Dr. Joy affirms, that he has known a belladonna plaster over the præcordial region, renewed every week or ten days at farthest, procure very considerable alleviation of the attacks.

XV. NEURALGIA OF THE HEART.

Under the name *Neuralgia of the Heart*, an acutely painful intermittent affection of the heart has been described, which is obviously of a nervous character, and seems to differ from angina pectoris more in regard to the small number of parts, which are drawn into morbid consent with the suffering cardiac nerves, than in regard either to its

nature or appropriate treatment: many writers, indeed, term angina pectoris neuralgia of the heart. It consists in acute lancinating pain, often of great intensity, darting through the præcordium from before backwards, and emerging under the left shoulder. It is commonly confined to the heart itself, the respiratory system continuing unaffected. Those cases in which the pain extends to the left arm, and side of the neck, and *à fortiori* those in which the parietes of the chest are implicated, are referred to the disease last considered. These very cases, however, which are classed under neuralgia of the heart, might be ranged under angina pectoris by those who consider this disease to be neuropathic. It is said to originate most frequently under the influence of long continued over-exertion of mind, or anxiety, acting on an irritable and nervous temperament, and is sometimes connected with a rheumatic or gouty tendency.

The **Treatment** is essentially that adapted for angina pectoris, or rather for neuralgia in general. It is frequently very obstinate, and resists all remedies, finally yielding to some new evolution of the system with which it is incompatible, or terminating fatally.

XVI. DISPLACEMENT OF THE HEART.

Synon. Ectopia cordis; *Ger.* Ectopie, Dislocation oder Lageveränderung des Herzens.

Occasionally, the heart is thrust out of its place by diseases of other organs—as by a copious effusion of serous fluid, blood, or air, which may force it into the right side, or farther to the left, according to the precise seat of the effusion. In the same manner, the fluid of ascites, great enlargement of the liver, or abdominal tumours, by pressing on the diaphragm, may displace the heart upwards. The heart may likewise be drawn over, in a remarkable degree, to the right side, by the absorption of fluid effused into the right pleura as the result of pleuritis.

These displacements may be detected by percussion and auscultation.

SECTION II.

DISEASES OF THE ARTERIES.

In treating of the diseases of arteries, allusion will be more especially made to the morbid conditions of the larger vessels, and especially of the aorta. The other more superficial vessels are rarely affected with disease, except as the result of external injury; and, consequently, their lesions fall under the domain of surgery. The morbid conditions of the larger arteries are of the same nature, however, as those of the smaller, and the results of the consideration of the former may, with propriety, be transferred to the latter.

All the arteries, so far as they can be traced, consist of three coats, separated from each other by the common uniting and separating tissue—the cellular. The *outermost* coat is cellular in its character; the *next* is fibrous, composed of the *tissu jaune* of the French anatomists, eminently elastic, and perhaps contractile, but not formed of muscular fibres; and the *inner* coat is of a serous character, and

secretes a thin fluid, which, in health, keeps it lubricated, and thus prevents friction.

The sympathetic relations between the larger arteries and the rest of the economy are by no means intimate. They form tubes, endowed with more or less contractile and elastic property, through which the blood moves; and when any particular lesion affects them, the chief symptoms are those produced by mechanical obstruction of the circulation: there is rarely much disorder caused in other functions. The organic lesions, to which the arteries are subject, are inflammation—acute and chronic; cartilaginous, osseous, and steatomatous formations; cysts; softening; dilatation, contraction, &c., each of which will require a distinct consideration.

I. INFLAMMATION OF ARTERIES.

Synon. Arteriitis, Arteritis, Inflammatio arteriarum; *Fr.* Artérite, Inflammation des artères; *Ger.* Schlagaderentzündung, Arterienentzündung.

Inflammation of the arteries is seated in the vasa vasorum, or the vessels which supply the arteries with blood for their nutrition.

During the last century, the ideas of practitioners on the subject of inflammation of the inner coat of arteries were extremely vague; and if redness were perceptible, this was esteemed to be sufficient evidence of its presence. Of late years, however, experiments have been made on this subject, and the researches of various pathologists have shown, that when there is only redness without any physical alteration of the inner membrane, this may be wholly cadaveric, and simply owing to imbibition. It is constantly met with where putrefaction has commenced, as well as in those who have died from small-pox or other eruptive fevers.

Diagnosis.—The arteries are by no means sensible in the healthy state; but, when affected with acute inflammation, pain is commonly present, and at times to such an extent as to lead to the belief that it is neuralgic. The pain may follow the course of the aorta, if the inflammation be there,—*Aortitis, Inflammatio aortæ;* Fr. *Aortite, Inflammation de l'aorte;* Ger. *Entzundung der Aorta, Aortenentzundung,*—or the particular arterial trunk in which it may be seated; but there are no signs which are pathognomonic of aortitis. The local pulsations in arteriitis, at the commencement of the disease, are frequently extremely energetic, and are regarded as one of the best single signs of incipient arteriitis—the difference between the energy of the pulsations in the affected vessels and in others being marked. Where the artery can be pressed upon—as in the case of the carotid—the pain is augmented; and, at an early period of the disease, more or less rigidity of its parietes may be felt by the finger. It has been affirmed, too, that in the early period of the disease a particular *bruissement* or murmur, which appears to be owing to the rugous and unpolished state of the inner membrane induced by the inflammation, is appreciable to the touch, but especially to the ear, aided by the stethoscope. It exists more especially in the large vessels, as the aorta and its principal divisions.

In a case of aortitis, in which the inflammation was limited to that

vessel, the following symptoms were observed. After being exposed to cold, the patient experienced a sense of constriction in the chest, which disappeared gradually. A few days afterwards, under the influence of a moral emotion, he was attacked with considerable dyspnœa, which was intermittent, and accompanied by acute pain under the sternum. The number of the pulsations was 80 in the minute. He died in a paroxysm of dyspnœa; and, on dissection, no morbid appearances were perceptible except those of unequivocal inflammation of the aorta. In three fatal cases which have been described by M. Thierfelder, there was a very frequent and hard cough along with the other symptoms.

The same phenomena have been observed in inflammation of the pulmonary artery.

In a case, apparently of aortitis,—of inflammation, indeed, of the aorta, iliac, femoral, cœliac, carotid, and subclavian arteries, and perhaps of others not examined,—which occurred in the wards of the Philadelphia Hospital, and has been recently described by Dr. Geo. N. Burwell, of Buffalo, who, at the time of the patient's admission, was one of the resident physicians at the Hospital,—the following were the main phenomena. A strong man, healthy, with the exception of some pain in the side for two or three weeks, which was not severe enough to confine him to the house,—after an ordinary day's work, was awakened suddenly in the night by severe pain through his chest, which continued without intermission until his death, which took place about twenty-two hours from the first accession of pain. The phenomena were those of neuralgia of the heart; but the morbid appearances—Dr. Burwell thought—were decidedly those of arteriitis. It will be seen, however, that such appearances are often very equivocal, and may lead to erroneous inferences.

Dr. Corrigan has attempted to show, that inflammation of the lining membrane of the aorta at its origin may give rise to a train of symptoms like those of angina pectoris; and that, consequently, it ought to be placed amongst the causes of that formidable disease. It is more probable, however,—as M. Grisolle has suggested,—that the aortitis, in such cases, is only an accident, a complication of the angina.

In the smaller arteries, arteriitis may end in the obliteration of the vessel, and death may supervene on spontaneous gangrene induced from this cause. It has, indeed, been presumed by M. Bérard, that acute arteriitis must always end in such obliteration; but facts, do not appear to have confirmed this. It can be readily understood, that if one of the arteries proceeding to an extremity be obliterated by inflammation, the limb may become atrophied; but, in other cases, the atrophy may be prevented by the collateral circulation, which is gradually established. The danger as to life from this inflammation must depend upon the importance of the vessel, and the extent of the mischief. After all, however, the disease almost always runs its course for good or for evil, without being suspected by the physician.

Causes.—Inflammation of arteries may be induced by mechanical agents,—as by ligature; but, most commonly, the disease is developed

spontaneously, and under the influence of internal causes. It would seem, likewise, that the rheumatic, gouty, and syphilitic diatheses have a decided influence on its development; and certain poisons, mercury and ergot, for example—it has been affirmed by M. Maisonneuve—exert a like effect.

Pathological Characters.—It has been already remarked, that simple redness of the inner coat of an artery is not of itself sufficient evidence of inflammation—*Endo-arteriitis*—as it may be cadaveric, and be caused by imbibition. It is always present, however, in true inflammation, but not singly. Some morbid change is to be met with in the texture of one or more of the coats of the vessel; and here, as in every other case of inflammation, there must be evidences of altered nutrition, otherwise doubt must exist as to the presence of true inflammation. M. Grisolle states expressly, that the redness, which depends upon inflammation of an artery, differs, in no respect, from that which is the effect of cadaveric imbibition. The observations collected on man, by MM. Laënnec and Louis, and those which have been made upon animals, by MM. Andral and Dupuy, and by MM. Trousseau and Leblanc, accord, he says, in showing, that redness is an insufficient sign of arteriitis. To prove that this condition exists "there must be the coincidence of some alteration in the nutrition of the tissues, such as thickening and friability of the inner membrane, which is often, in such cases, withered, villous, or unequal, and adheres more or less to a fibrinous clot, more or less deprived of colour." The inner coat may have lost its polish from the arrest of the wonted secretion, and have a villous, rugous, or granular aspect. Slight excoriations, or superficial ulcerations are likewise observed here and there. At other times, the membrane is softened, and so pulpy that it can be removed by friction with the handle of a scalpel; whilst at others, again, it is thicker and firmer than usual. When the cellular tissue that separates the inner from the middle coat is infiltrated and softened, the inner coat can be more readily removed in its entire state. In addition to these appearances, plastic lymph is often found adhering to the inner coat, and this appears, at times, to have gradually augmented in quantity until the calibre of the artery has become obstructed; and, lastly, when the arteriitis is carried to a very high degree, suppuration takes place, and all the coats of the vessels may be involved. While these phenomena are taking place chiefly in the inner coat, the external coat is largely injected, and this has been esteemed, by M. Gendrin, as the very first phenomenon in arteriitis—*Exarteriitis*.

In the course of the inflammation, the affected vessel loses its elasticity, and under its softened condition may give way on the slightest effort.

The morbid phenomena in arteriitis have been studied on animals, and found to correspond essentially with those just described. If an artery be subjected to pressure so as to induce irritation, in ten or twelve hours a false membrane is secreted into the interior of the vessel, and the blood is found to be coagulated. If the clot and the false membrane be removed, the inner coat is observed to be red and friable, to have lost its polish, and to present a granular appearance; but the

hyperæmia is especially marked in the cellular tissue situate between the internal and the middle coat, which—as well as the cellular tissue between the middle and the outer coat—is found to be infiltrated by a reddish-coloured serum. Later on, the inner coat is more rugous, thicker, and opaque, and can be readily detached: the other two membranes are likewise more friable, and, in process of time, they form but one mass, which tears with the greatest facility.

Treatment.—Where the disease is diagnosticated, it must be treated energetically by bloodletting, repeated according to the strength of the individual. Leeches may be applied over the inflamed vessel where this is practicable, and the pain must be relieved by large doses of opium or its preparations, (two or three grains of opium in a soft pill—or 70 or 80 drops of the *tinctura opii*—or a grain or a grain and a half of one of the salts of morphia—the acetate, the muriate, or the sulphate.) Large doses must be administered for two reasons:—in the *first* place, they relieve the pain: they must, consequently, be repeated, until the effect is induced; and, in the *second* place, they are precious sedatives, and well adapted to allay the morbid condition of the vasa vasorum, which constitutes the disease.

II. OSSIFICATION, AND OTHER MORBID FORMATIONS IN THE ARTERIES.

a. *Ossification; Artériostéie*, of Piorry.

Under the influence of chronic arteriitis—it is presumed by many—but, doubtless, often from a morbid condition of the system of nutrition of the parietes of the vessels—various morbid depositions take place in them; and among these, one of the most common is ossification, which may be seated in detached parts of the artery, or occupy its whole circumference, so as, at times, to constitute a true calcareous canal.

Diagnosis.—When the deposits are first formed, there are no symptoms, which can indicate their existence; but when the ossification has made much progress, and especially if the artery be superficial—as the radial artery at the wrist—there is the feeling of a solid cord; and the pulsations are much less distinct than in the normal condition of the vessel. When the ossification is in the deep-seated arteries, there is no sign which diagnosticates its presence. It has been affirmed, indeed, by M. Gendrin, that a murmur (*bruissement*) may be heard, which is owing to the friction of the blood against the rough parietes of the vessel. In the cases in which the more superficial arteries are ossified, ossific deposits also exist in the heart, which may give rise to the different sounds already mentioned. In a case, which recently fell under the author's care, in a man 63 years of age, and in whom the arteries of the forearm and of the thigh could be felt distinctly osseous, a strong *bruit de scie* or "*saw-sound*" was heard synchronously with the first sound of the heart; which last had a ringing character, whilst the second sound was roughened.

After an artery is ossified, it is liable to become obliterated or ruptured: and in all cases, the circulation cannot fail to be retarded by the destruction of the elastic and contractile power of the parietes of the vessel. It can be readily understood, that the lesion may give occasion to aneurisms, hyperæmiæ, and hemorrhage; and it is pretty

generally thought, that the ossification of the vessels of the lower extremities is the cause of the *gangræna senilis.*

Causes.—Ossification of the arteries is a very common occurrence in old age, and has, indeed, been regarded as a part of the healthy state of the aged. Above 60 years of age, it is rare to meet with the arterial system perfectly free from ossific depositions. They have been found, however, at all ages; and it is believed, that syphilis, mercury, gout and rheumatism may favour their development.

Pathological Characters.—At first, the affected portions of the vessels are soft and easily lacerable, the morbid production seeming to be nothing more than a deposition of plastic lymph in the substance of the inner coat, or rather between it and the second. At a later period, these portions acquire a cartilaginous consistence; and at length calcareous salts are deposited, which give the appearance of bony concretions. They are not, however, real bone, appear to be possessed of no definite arrangement; have no bond of union of animal matter, and are devoid of vitality. In the case referred to above, the left ventricle was hypertrophied, and the aortic valves irregularly ossified, except at their free margins. The ossific deposits were of an irregular shape, angular, and varying in size from that of a grain of wheat, to that of a mustard seed—each valve containing fifteen or twenty. The aorta, in this case, presented a few roughened points; but the external iliacs, commencing at the bifurcation of the aorta, were ossified, the ossification extending to the termination of the arteries. This ossification was so complete as to prevent the collapse of the vessels, and to allow tubes of solid calcareous matter, half an inch in length, to be removed. The calibre of the vessels was less than usual,—the femoral artery admitting with difficulty, an ordinary silver female catheter. Commencing at the subclavian artery, the same condition existed throughout the superior extremities. The carotids were not ossified.

Treatment.—No plan, either of prevention or cure, can be suggested.

b. *Morbid Formations.*

Various morbid formations are met with at times, which follow nearly the same course as ossification of the arteries. Yellowish patches are occasionally found beneath the inner coat: these, when opened, discharge an *atheromatous matter*, which has been regarded, by Professor Gross, of Louisville, as tubercular,—the physical properties, mode of secretion, and final conversion into purulent fluid, marking its similarity, if not identity, with tubercular formations in other textures of the body.

At other times, morbid depositions are observed in the same situations, which are of a firmer consistence, and of a steatomatous character. Cysts, too, of the size of a walnut, and containing a reddish or blackish matter, have been met with.

c. *Ulcerations.*

Ulcerations are occasionally seen,—at times isolated, but, at others, aggregated together,—their surfaces being covered by a puriform

layer. At times, it would seem, the ulcerations lead to perforation of the vessel and to fatal hemorrhage. They may, however, cicatrize: appearances, at least, of cicatrization have been perceptible, which may have been the only evidence of the previous existence of ulceration.

There are no symptoms by which these different lesions of the internal arteries can be diagnosticated, and, accordingly, it is impossible to lay down any definite plan of treatment.

III. ANEURISM.

Synon. Exangia aneurisma, Aneurisma, Abscessus spirituosus, Aneurysma, Aneurysm, Dilatatio arteriarum, Arteriectasis, Arterieurysma; *Fr.* Aneurysme, Anévrysme; *Ger.* Pulsadergeschwulst.

It has been properly remarked by Dr. Mackintosh, that there is no disease, which shows the absurdity of the division of medicine into physic and surgery more than aneurism. When it is within the reach of the knife, it is called a surgical case; if not, it is handed over to the physician.

Aneurism properly means dilatation of a vessel; but this dilatation may be variously effected. All the coats may be dilated at once, in which case we have *true aneurism*, in contradistinction to the *false aneurism*, which is owing to the giving way of the coats, and the extravasation of the blood. In *mixed aneurism*, the tumour may be formed by the dilatation of the outer coat of the artery, the inner and middle coats having experienced a solution of continuity; or it may be formed by the dilatation of the inner and middle coats, through a solution of continuity of the outer coat. Occasionally, the blood insinuates itself through a fissure of the internal and middle coats of the aorta, and forms itself a channel between the outer and middle coats. In one case, described by Mr. Shekelton, the blood, after detaching the two inner coats of the aorta, made its way again into the vessel lower down. This is what is termed *dissecting aneurism*, cases of which have been reported, by Drs. Pennock, Goddard, and Washington, of this country. In all the cases described by these gentlemen,—according to Dr. Pennock, in his excellent edition of Hope on *The Diseases of the Heart and Great Vessels*, (Philad. 1842)—the lesion was identical, and consisted in the separation of the laminæ of the middle coat by blood driven by the propulsive force of the heart through a rent caused by a laceration of the inner coat, and a partial rupture of the layers of the middle coat. "I am induced," Dr. Pennock remarks, "from the examination of these pathological specimens, and from the fact that the attachment of the external fibres of the middle coat to the cellular is much firmer than is that of the layers of the middle tunic between themselves, to believe, that dissecting aneurism, when it occurs to any extent, will be found to be *between the laminæ of the middle coat*, and not between the middle and the outer coats, of the artery. Many cases of this lesion have now been recorded.

Wherever aneurismal tumours exist, they cannot fail to affect the organs in their vicinity. Their walls become gradually thicker, and

they seem to be occasionally formed at the expense of the cellular texture with which they come in contact. Adhesions, too, are gradually formed, and, as the dilatation augments, pressure is made on the surrounding organs and tissues, under which they become at times inflamed: at others, the absorption of soft parts, and even of bones, is occasioned, so that an aneurism of the aorta may, in this manner, destroy the sternum. When such is the case, and the aneurismal sac loses its support, its parietes undergo morbid changes, give way, and the patient may die at once from the profuse hemorrhage; or the blood may be extravasated into a fresh cellular cavity, which sooner or later may yield likewise. In rare cases, the fibrinous coagulum, which forms in the aneurismal sac, becomes organized in its external layers, whilst the rest of the clot is absorbed; the calibre of the dilated vessel may, in this way, be diminished, and a spontaneous cure be effected.

There are but few vessels in the internal parts of the body, which are liable to aneurism, and which, consequently, fall under the attention of the physician. The thoracic and abdominal portions of the aorta are most frequently affected, and the consideration of aneurism of those vessels may be transferred to the same lesion when affecting others.

a. *Aneurism of the Aorta.*

Synon. Aorteurysma; *Fr.* Anévrysme de l'Aorte, Aortiectasie, (*Piorry.*)

The thoracic aorta is more frequently aneurismal than the abdominal; and commonly the dilated portion is limited in extent. It is not an uncommon affection. In the winter of 1843-4, the author had an opportunity of exhibiting to the clinical class of the Philadelphia Hospital the morbid appearances presented in three cases of internal aneurism,—two of which were of the aorta, and one of the internal iliac—occurring in the wards under his charge. The subjects were all females.

Diagnosis.—In the early period of aneurism of the aorta, and when the tumour is small, there may be no symptoms to indicate its existence. This is what has been termed the latent period of the disease. Sooner or later, however, unusual pulsations are experienced in the direction of the sternum, and over the ribs, in situations where they are not perceived in health.

Attempts have been made by M. Piorry to diagnosticate the course of the ascending aorta and its arch, by pleximetric percussion, so as to deduce the abnormous sounds of aneurism. On applying the ear or stethoscope to the chest, along the course of the aorta, and even over the costal cartilages of the right side,—when aneurism exists, a double beat is heard, which is not very intelligible; or a simple shock is felt. The sound is peculiar at times, but at others it is a *bruit de soufflet* or *bellows' sound.*

When the aneurism is seated in the ascending aorta, the pulsations are most perceptible at the sternum and the cartilages of the ribs; but when the descending aorta is affected, they are more perceptible along the dorsal vertebræ. When the tumour attains such a size as to press upon the pulmonary apparatus, more or less difficulty of breathing

arises, which gradually increases; and when it presses on the trachea, a peculiar whistling sound is heard on inspiration and expiration, and, at times, there is a remarkable change in the character of the voice. If the tumour presses upon the œsophagus, difficulty is experienced in deglutition; and if on the veins, the return of blood to the heart is impeded, so that it accumulates in the superficial veins of the arm and chest. It can be readily understood, too, that, according to the precise seat of the disease, the pulse of the two arms may be variously affected, and that the same result may follow the pressure of the tumour on the subclavian artery, or the brachial plexus of nerves of one side. Pain is not always a concomitant. At times, however, acute pain is experienced under the ribs or sternum, or in the back, whence it irradiates to every part of the thorax, and frequently, it is affirmed, this is the only symptom—neither pulsation nor tumour being perceptible; but strange pains are felt, which cannot be easily accounted for, and which may be confounded with neuralgia or rheumatism.

The author has known several cases in which the thoracic and laryngeal symptoms have caused aneurism of the aorta to be mistaken for cynanche laryngea, and the mistake has not been detected until after death.

When the aneurismal tumour becomes very large, sounds are heard on auscultation, which lead to its detection. These are pulsations, which are isochronous with those of the pulse at the wrist, but are clearly distinct from those of the heart. Occasionally, the tumour projects at the superior aperture of the chest; but, more commonly, it is first observed forming a prominence at the sides or front, pressing against the ribs or sternum, and occasioning their absorption; and, at times, disarticulating or destroying the clavicle, and projecting in the form of an irregularly shaped but acuminated tumour. The progress of these aneurisms is usually slow, and, occasionally, they attain an enormous size. Generally, death occurs, owing to the giving way of the sac; the blood being, at times, discharged into the pericardium, but this is rare; at others, into the cavity of the pleura; or, through adhesions, into the trachea, or bronchia,—the event being announced by profuse hæmoptysis; and at others, again, into the œsophagus, when the blood is discharged by vomiting. When the aneurism has made its way externally, it commonly breaks by means of an eschar or slough; but if it give way in the chest, it is usually by a simple fissure, or by rupture. Still, there are cases in which aneurisms of the aorta have been cured spontaneously. In such cases, on examination after death, the tumour has been found reduced to an inconsiderable size, and to be occupied by a fibrinous deposition arranged in very dense laminæ, which has obliterated the cavity of the sac. These results may have supervened either spontaneously, or under the efforts of art. Lastly, death may occur before the rupture of the aneurismal sac, either owing to the pressure of the tumour on the œsophagus, which may prevent the necessary sustenance from being taken, or to asphyxia induced by the flattening of the trachea by it.

Such are the symptoms of aneurism of the thoracic aorta. When the *abdominal aorta* is concerned, and the aneurism is of a small size,

no symptoms may indicate its presence. When larger, a tumour can at times be detected by careful examination, which affords pulsations isochronous with those of the heart, and occasionally a distinct bellows' sound may be heard. It must be borne in mind, however, that any tumour of the abdomen, which lies upon the aorta, may be the medium of communicating the pulsations of the artery to the hand placed on the abdomen. Feculent matter detained in the folds of the colon, or gas pent up in the intestine, may simulate aneurism; and excellent observers have been deceived in this way. Pulsations in the epigastrium may, also, like palpitation, be dependent upon nervous causes, and occur in paroxysms, in dyspeptic persons, from mental emotions, &c. (See p. 568.)

As the aneurismal tumour augments in size, it cannot fail to interfere with the functions of the abdominal viscera, and with the proper circulation of the blood; hence arise various dyspeptic symptoms, infiltrations into the peritoneum, lower extremities, &c. When the tumour gives way, the blood may be poured into the cavity of the peritoneum, or, through adhesions, into the stomach or intestines.

Causes.—These are not clear. Those enumerated are,—hypertrohy of the heart; the isolation of the vessel; the frequency of accidental productions in its parietes; tight clothing; intemperance; moral emotions; and whatever augments the activity of the circulation. It is probable, however, that some nutritive change takes place in the parietes of the vessels themselves, so that they are predisposed to aneurismal dilatation; and, when this is the case, the causes, above enumerated, may act as excitants.

Treatment.—When the disease is detected, the great object must be to moderate the impulsion of the blood, and to diminish the amount of the circulating fluid. This is applicable to all aneurisms, where the object is to cause their obliteration without any surgical operation. Blood, it is presumed, may thus coagulate, and form the laminæ, before described as existing where an aneurismal sac has become obliterated spontaneously or under the efforts of art. This plan may be carried into effect by repeated small bleedings, and a diet so restricted as to be merely adequate to the maintenance of life. It is essentially the method of Valsalva, and it affords the greatest probability of success; yet the cures produced by it have not been numerous. The acetate of lead has been recommended as a sedative, (gr. vj. to x. in the day,) and good effects are said to have resulted from its protracted use. Dr. Joy affirms, that it has been prescribed with the view of augmenting the coagulability of the blood.

b. *Aneurism of other vessels.*

Aneurisms have been noticed in other internal vessels; for example, in the *coronary artery of the heart.* One case at least of this is recorded, in which a deep-seated pain was experienced under the sternum, which returned periodically at night, and when the patient was in the horizontal posture, and ceased when he was erect. He was able to attend to his occupations; but, one night, on retiring to rest, he experienced an acute pain in the back and in the occiput, and imme-

diately fell dead, the artery having given way, and the blood being poured into the pericardium. Aneurisms have also been observed in the *basilary*, the *cœliac*, the *hepatic*, *gastric*, *renal*, *mesenteric*, and other vessels of the splanchnic cavities; but their occurrence is very rare, and they afford no certain signs by which they can be diagnosticated.

IV. CONTRACTION OF THE ARTERIES.

SYNON. *Fr.* Rétrécissement ou Resserrement des Artères, Artériarctie (Piorry).

This is an uncommon affection, but it is occasionally met with congenitally; and at others as the result of disease. The aorta, for example, has been found contracted throughout its whole extent, but in other cases in a limited space only. The narrowness is, at times, so great that a common goose-quill cannot pass, or even a fine probe; and, occasionally, the vessel is wholly obliterated.

The diagnosis must necessarily be difficult. If blood cannot pass freely along the aorta, we should expect to hear the *bruit de soufflet*, and that hypertrophy of the heart would supervene in consequence of the increased effort required, on the part of the left ventricle, to propel the blood. It is presumable, likewise, that the parts of the frame, seated beneath the obstacle, would at first, at all events, be less perfectly nourished, and that they might become atrophied; but a free collateral circulation may be established, and the patient survive.

The causes of contraction are either chronic inflammation, or some of the morbid formations already described.

The pulmonary artery, as elsewhere remarked, has been found contracted; and there is no part of the arterial system that is not liable to it.

V. NERVOUS PULSATIONS OF ARTERIES.

SYNON. *Fr.* Battemens nerveux des Artères.

Nervous pulsations of arteries are most commonly, if not universally, witnessed in the abdominal aorta. They are almost exclusively met with in nervous subjects. Laënnec ascribed them altogether to nervous and hysterical irritability with spasm of the aorta; but Dr. Hope maintains, that anæmia—a deficient, or too watery state of the blood—is the most essential constitutional cause, whilst nervousness, whether pre-existent or consequent, co-operates by accelerating the circulation. Dr. Stokes affirms, that he has seen a pulsation of the abdominal aorta or its immediate vessels symptomatic of inflammatory disease of the digestive system. In other words, he maintains, that "we may have from enteritis or peritonitis a throbbing of the abdominal aorta or its vessels, perfectly analogous to the morbid action of the radial artery in whitlow, or of the carotids or temporal arteries in cerebritis." The cases in which he has most frequently observed this phenomenon are those of the gastro-enteric fever of Ireland; also in cases of fever after corrosive poisoning, where the pulse was almost absent at the wrist; and in peritonitis, where no pulse could be felt. In several instances, this want of proportion between the action of the radial and the abdominal arteries, *combined with fever* was the princi-

pal indication of enteric disease. The author has never met with the phenomena described by Dr. Stokes. Unusual abdominal pulsation can, therefore, only be regarded as a symptom belonging to various morbid conditions. It is sometimes the cause of great distress with thin, nervous persons, under the apprehension that it unequivocally indicates the presence of aneurism of the abdominal aorta, or of the cœliac artery. The author has never, however, met with a case in which aneurism really existed; and Dr. Baillie affirmed, that he was constantly consulted for inordinate pulsation in the epigastrium, and notwithstanding his extensive practice, he never met in his whole life with but three examples of aneurism of the cœliac artery.

The pulsations of the abdominal aorta are especially marked about the part where the cœliac artery leaves it.

Diagnosis.—The affection is characterized by more or less violent pulsations, which are visible to the eye, but more perceptible to the hand, and which extend from the epigastrium to the umbilicus, and even to the bifurcation of the aorta. By applying the ear or the stethoscope, no morbid sound is heard; but a strong impulse is experienced as if an aneurismal tumour existed there. By palpation and percussion, however, it can generally be determined, that the vessel has not experienced any increase of size. The impulse, instead of being the gradual heaving or expansion of an aneurism, is a smart, vigorous jerk; and the sound, when any exists, is, according to Dr. Hope, merely a short whiff, distinguishable by its shortness from venous murmur, and audible along the whole course of the vessel, instead of being loudest at one spot as in aneurism.

When the pulsations exist in conjunction with air pent up in the colon or duodenum, presenting the feel of a compressible tumour, the resemblance to aneurism is more complete, and greater care is demanded in the diagnosis. Immovable solid tumours may also rest on the vessel, and convey its pulsations, but such cases are rare.

Treatment.—This is essentially that required in nervous palpitation (p. 550).

SECTION III.

DISEASES OF THE VEINS.

The veins, like the arteries, have three coats in superposition. The *outermost* is cellular, dense, and very difficult to rupture; the *middle coat*, the proper membrane of the veins, is fibrous, but exhibits no signs of muscularity, although its chemical nature is suspected to be fibrinous. Like the middle coat of the arteries, it is considered to be formed of the *tissu jaune* of the French anatomists, is more probably gelatinous in its nature than fibrinous; and, like it, is perhaps contractile, and unquestionably elastic, but not to the same degree. It has been supposed, but on insufficient evidence, that its contractile action is one of the principal causes of the return of the blood to the heart.

The *inner* coat is extremely thin and smooth, very extensible, and yet presenting considerable resistance, so that it bears a very tight ligature without being ruptured. In many of the veins, parabolic folds or valves exist, which are intended to permit the blood to flow towards the heart, but to prevent its retrogression. They are entirely wanting, however, in the veins of the deep-seated viscera; in those of the brain and spinal marrow; of the lungs; in the vena porta; and in the veins of the kidneys, bladder and uterus; but they exist in the spermatic veins, and sometimes in the internal mammary, and in the branches of the vena azygos.

The veins, like the arteries, are nourished by *vasa vasorum*, or by small arteries, which have their accompanying veins.

The extensibility of the veins in the longitudinal direction is less than that of the arteries, whilst it is greater laterally; on this account, they more readily admit of dilatation. Dilatations or *varices* are often seen in the superficial veins of the extremities. When the integuments possess their proper degree of tone, and no impediment exists to the return of blood to the heart, these vessels may be imperceptible; but, under opposite circumstances, they dilate. The parietes of the veins are much thinner than those of the arteries; hence they are of a bluish tint during life, owing to the colour of the blood appearing through them. After death, they are whitish and translucent.

Although the same nerves—the ganglionic—are distributed to both arteries and veins, there seems to be a more intimate relation between the latter and other important parts of the system; so that when inflammation, for example, affects them, the central organs are more liable to be seriously implicated.

I. INFLAMMATION OF THE VEINS.

Synon. Phlebitis, Inflammatio venarum; *Fr.* Phlébite, Inflammation des veines: *Ger.* Blutaderentzündung, Venenentzündung.

Inflammation of the veins has been studied more especially in recent times, and in some of its bearings—as regards the uterine veins for example—in recent times only.

Diagnosis.—The inflammation may be local, or it may be accompanied by general symptoms. The phlebitis that supervenes occasionally on bloodletting affords a good example of its progress. In this case, a local pain is first experienced, with tumefaction and redness of the edges of the wound; a reddish or purulent fluid is discharged from the aperture in the vein; and the inflammation, which was restricted to the orifice, terminates either by resolution, or by the formation of a small abscess, which heals in a few days. More commonly, however, the inflammation extends along the vessel; the pain increases; the skin becomes red and tense; the course of the vein is readily determined by a red mark; and when the vessel is pressed upon, the pain is greatly augmented; and the vein is felt more or less hard, knotty, and rolling under the finger. The limb swells, and becomes œdematous; a whitish secretion covers the wound in the vein, and pus is discharged more or less copiously from it. The constitution now sympa-

thizes; symptomatic fever arises; and death takes place—according to some, owing to the sympathetic connexions between the inner membrane of the blood-vessels and the vital organs;—according to others, by a kind of poisoning from the absorption of pus. The last period of the disease is generally marked by shivering, heat, and vague pains—superficial or deep-seated—in the joints or different viscera, putting on the appearance of the erratic forms of rheumatic affections. To these succeed ataxic symptoms; and delirium supervenes, which recurs by exacerbations, or continues until the end of the disease. At other times, the patient sinks into a state of adynamia or collapse; the features become changed; the face pale, and the debility general; the tongue is at first red, but afterwards dry, and covered with a blackish fur; the abdomen is tympanitic; diarrhœa ensues; the pulse is small, quick, and frequent; copious clammy sweats bedew the surface; and there is an eruption of petechiæ, with gangrene, and subsultus tendinum, which are the precursors of a fatal termination.

When the inflammation of the veins is local, it is susceptible of cure; but when once it has become general, it defies all the resources of art. At times, a complete remission takes place in all the symptoms, and the case appears to be improved; but suddenly the febrile symptoms reappear; all the phenomena become more serious, and the patient sinks rapidly.

When phlebitis takes place in the deeper seated vessels, the diagnosis is not easy, and often it can only be suspected by the general symptoms which have been pointed out. The delirium may attract the attention of the practitioner to the head; the redness of tongue and diarrhœa to the intestines; and the erratic pains may induce the belief that the mischief is mainly rheumatic. The most careful discrimination is demanded in such cases; and, after all, the true nature of the disease may only be revealed by dissection. In a communication to the Medical Society of Riga, M. Stracksen gives the following symptoms as having been present in three cases of phlebitis so prominently as to warrant, in his opinion, their being considered diagnostic of the disease:—an indescribable restlessness and anxiety, seen in scarcely any other disease to the same extent,—pulsation of the veins and proportionately violent fever, with very frequent pulse, but softer than in arteritis; short and painful breathing, very different from that which attends pneumonia,—the fatal termination of the disease often occurring on the fourth or sixth day, from complete disorganization and consequent loss of power of the veins.

Causes.—The causes of phlebitis are generally lesions of the inner coat of the veins; at times from mechanical injuries; at others from no assignable influence.

Pathological Characters.—These may be observed in the veins in which the phlebitis commenced, or in the different organs which have become implicated secondarily. The internal coat of the vein is injected and red; but this appearance, as was remarked of the endocardium, and the lining membrane of the arteries, is equivocal; unless, on careful examination, organic changes are found to have been induced in it. When the inflammation has persisted for some time,

the redness will be found to have extended to the other coats of the vessel, all of which may be thickened, softened, unusually lacerable, and readily separable from each other. Ulcerations have likewise been met with in the inner coat. Within the vessel, fibrinous clots and purulent matter, or a fluid resembling pus, have been found. Suppuration is said, indeed, to be the most common result of phlebitis, but it has been doubted by Dr. Mackintosh, whether pathologists have always been able to discriminate between pus and lymphy effusion.

The blood, in such cases, has been found diffluent and similar to currant jelly; pus globules have been observed in it, not only with the microscope, but with the naked eye; and M. Grisolle affirms, that in traumatic phlebitis of the legs, he has detected pus even in the crural and iliac veins. The bodies of those who die under such circumstances are said to putrefy more promptly, and M. Bérard has observed every part exhaling a purulent odour.

Obliteration of the vessel is a common sequel. At times, the course of the blood is impeded; or it may be wholly arrested by coagula which form in it. These may be redissolved, so that the course of the blood may be again rendered free; but if the inflammation be very violent, the vein may become wholly obliterated, and be converted into an impervious ligamentous cord. Of course, when this happens, there is for a time more or less interruption to the return of the blood to the heart; but this becomes sooner or later rectified.

When the inflammation of the veins affects the superficial vessels, the skin presents the same appearance as in erysipelas; but when the deep-seated vessels are concerned, it may be less coloured than natural, and œdematous. This is supposed to be the case in phlegmatia dolens, which is presumed by many to be owing to phlebitis of the large veins, that carry the blood back from the lower extremities, and consequent transudation of the watery and albuminous portions through the coats of the distended veins into the surrounding cellular tissue; hence, it has been termed by Dr. Lee *crural phlebitis*.

The morbid secretions and the modified blood—it has been conceived—by passing into the mass of the blood, and vitiating it, may be the cause of the serious symptoms that arise in many cases, which, as has been shown, terminate fatally under all the symptoms of the ataxic and adynamic (typhoid) condition. It has, indeed, been maintained by M. Dance, that typhoid or malignant puerperal fever is essentially caused by uterine phlebitis and its consequences. It may admit, however, of great question, whether the typhoid condition, in such cases, be entirely owing to the admixture of pus and other matters with the blood; inasmuch as where the phlebitis remains entirely local, and terminates in health,—notwithstanding the secretion of pus and of plastic lymph may be established in the part affected,—no such constitutional mischief arises, although these secretions must as necessarily pass along the inflamed vein, and become mixed with the general mass of blood. That the condition of the circulation is modified in some manner, however, would seem to be shown by the fact, that abscesses, called *metastatic*, are apt to take place in various parts of the economy, and especially in the lungs, the parenchyma of which

is often found to contain numbers of small, purulent collections; so numerous, indeed, that if the scalpel be made to penetrate any portion of the lungs, it will enter one of them. Similar morbid collections have been found in the liver, spleen, encephalon, heart, kidneys, &c., and the most rational mode of accounting for them seems to be—that the modified condition of the blood occasions, in the tissues in which they are found, a secretion of pus, in the same manner as the blood, modified by the virus of small-pox inserted under the cuticle, gives occasion to small, purulent secretions over every part of the cutaneous surface. The notion that the pus, secreted by the vessel affected with the phlebitis, is carried along the vessels, and deposited in the parts where these purulent collections are found, is difficult of reception.

Besides these collections, other morbid changes, of a most serious character, are generally met with—as softening of the digestive tube, partial gangrene, different effusions, either into the splanchnic cavities or into the joints, and various other pathological changes, consequent on the extensive disorder in the solids and fluids of the whole economy. In some instances, it would seem, the eye has become disorganized after tying the saphena, and after the inflammation and obliteration of the jugular vein, and examples of a similar disorganization, ascribed to the same cause, are recorded as having occurred in the puerperal state.

Treatment.—At the commencement, and whilst the disease is external and local, the affection is wholly surgical. General bloodletting may be needed, but this is not often the case. Leeches may be applied in the course of the inflamed vein, followed by fomentations and cataplasms, and it may be advisable to make incisions into the tense and inflamed parts. Where the pain is very violent, full doses of opiates should be administered.

To prevent the absorption of pus, which—as has been remarked—has been looked upon as the cause of the alarming symptoms, it has been proposed to compress the vein immediately above the seat of the inflammation; but this plan has not been attended with any successful results. With the same view, the vein has been divided, but not with more advantage.

When the alarming constitutional symptoms have set in, the case must be regarded as almost hopeless. The system may have to be supported by tonics; and the distress allayed by opiates. No specific plan of treatment can be laid down, however; the practitioner will have to act to the best of his judgment in the emergency.

a. *Uterine Phlebitis.*

Synon. Phlebitis uterina, Metrophlebitis, Metritis venosa; *Fr.* Phlébite utérine; *Ger.* Entzündung der Gebärmuttervenen, Venöse Gebärmutterentzündung, Venenentzündung der Gebärmutter.

Diagnosis.—Various phenomena have been assigned to uterine phlebitis,—a circumstance which shows, that the symptoms are equivocal. It has been affirmed, that in the first few days after delivery, and succeeding to a sudden suppression of the lochial discharge, a painful

tumour is felt in the course of the veins of the ovary, [?] followed by infiltration of the lower extremities, or of one of them, with enlargement of the glands of the groin, and great pain in moving the hip joints;—that here and there, in the subcutaneous cellular tissue, or around the articulations, indolent abscesses or tumefactions occur; and that, sooner or later, these local symptoms are followed by delirium, irregular chills, and by the general symptoms already pointed out as indicating that the mischief has extended to the whole economy. By others, it is affirmed, that the uterus is enlarged in the first place, and gives rise to a hard, roundish, and considerable tumour, extremely painful on pressure; the lochia being, at times, diminished, and at others suspended, and a purulent, thick, whitish, or sanious, and commonly fetid matter flowing in their stead; that whilst the disease is limited to the veins of the uterus, the fever is not high, and the general phenomena are by no means marked; but as soon as the inflammation extends, either to the veins of the ovary, or to the other veins of the abdomen, the symptoms denoting the typhoid stage of phlebitis declare themselves. None of these symptoms can be regarded as pathognomonic of uterine phlebitis; and the fact would seem to be, that it may occur at first without any local pain, or other symptoms to indicate its existence, and may be limited, for a time, to the veins affected, in the same manner as in ordinary phlebitis from bleeding. In some cases, however, it rapidly implicates different veins,—the uterine, the spermatic, and the renal; and in one case, described by Dr. Robert Lee, in which the disease proved fatal on the evening of the fifth day after delivery, all these veins were found to be disorganized.

When the veins of the uterus are alone inflamed, the peritoneal and muscular coats being unaffected, there may be either no pain, or merely a dull pain with a sense of weight in the region of the uterus, and no local symptom by which the disease can be detected. The uterus, too, may return to its proper size or nearly so, and it is only on the accession of the constitutional symptoms;—rigors, prostration of strength, rapid, feeble pulse, low, wandering delirium, attacks of vomiting and diarrhœa, with brown parched tongue, and ultimately rapid and destructive inflammation of the eyes, and purulent deposits in the substance of the lungs, that the existence of this insidious and dangerous affection can be determined. As to the lochial discharge, much difference of sentiment exists. The opinions of MM. Rostan and Andral have been already given. According to Dr. Lee, it has sometimes been observed to be fetid and puriform, and, at others in a perfectly natural state; and where the lochia were offensive, this, in every case, appeared to be a consequence, and not a cause, of the uterine disease.

When phlebitis is restricted to the veins of the uterus, it may, if suspected, be treated successfully, like ordinary phlebitis, by antiphlogistics; but if it spread so as to affect the system, it is of as unfavourable prognosis as any similar form of phlebitis. Generally, it soon terminates fatally, but there have been cases in which the patient has lived as long as four months after delivery.

The microscope, according to M. Simon, frequently detects pus in the blood during the course of the disease; but if the quantity be small,

its detection may be a matter of much difficulty. M. Gendrin affirms, that when it is present the serum deposits a viscid urinary-like sediment, or else is turbid and cloudy. In two cases, M. Simon examined the blood analytically, and found the proportion of fibrin in one to be 7·640; in the other 4·440. He had several opportunities for examining the urine in this disease. In one instance, he found it of a dark colour, an acid reaction, and depositing a slight sediment of urate of ammonia and uric acid. In another, it had a slightly alkaline reaction, with a disagreeable ammoniacal odour; deposited a dirty yellow sediment, which appeared to the naked eye to be purulent, but was shown by the microscope to consist of an immense number of mucus-granules, a few crystals of ammoniaco-magnesian phosphate, and an amorphous precipitate of phosphate of lime and urate of ammonia. The clear urine gave off some carbonic acid on the addition of nitric acid, and became turbid, from which circumstance the presence of albumen was inferred.

Causes.—Uterine phlebitis is chiefly met with after delivery; but it sometimes results from the ligature of uterine polypus, and from metritis. Laborious labours have been ranked among the most common causes, but this is not a settled point. The disease is certainly observed after natural labours: it would appear, too, to be remotely dependent upon epidemic influence in many cases; and by some it has been even ascribed to contagious miasmata.

Pathological Characters.—The size of the uterus may be natural; but generally it is larger than it ought to be. At times, its cavity is lined by a grayish layer; and at others by a sanious and fetid secretion. Its parietes are thickened, softened, and occasionally of a blackish colour. The veins of the parietes of the organ are tortuous; their inner coat covered with a layer of plastic lymph; or the interior filled with a purulent fluid. The disease may be found to have extended to the ovarian, hypogastric, and more distant veins; and, as in the case of phlebitis in general, purulent depositions may be found in different viscera, with redness and softening of the digestive mucous membrane, extensive suppuration about the articulations, &c.

Treatment.—As has already been remarked, the symptoms of uterine phlebitis are equivocal; and, consequently, the disease is not detected in the first instance. The early symptoms may, however, suggest the application of leeches to the hypogastrium; but it does not appear, that we are in possession of any remedial agency, which can effectually control the disease, when once it has extended so as to affect the general system. Some, however, are satisfied, that mercury, employed in the worst cases, even so far as to excite salivation, is a powerful remedy. It would certainly be important, in all the varieties of inflammation that affect the deeper-seated structures of the uterus, to induce a new action in the system as speedily as practicable, and no agent can do this so effectually as mercury. Should it fail, the case must be regarded as sufficiently hopeless. It has, however, been employed, in several cases of uterine phlebitis, to bring the system speedily under its influence, yet the progress of the disease

was not arrested, and the patients died, as others had done, to whom mercury had not been administered.

In the latter stage, the great depression of the powers of the system suggests the cautious use of stimulants, of which wine, in the form of wine whey, is perhaps as efficient as any that can be given. In all such cases, it is proper to afford a certain degree of support; but to be careful not to administer diffusible stimulants too freely, as they may exhaust the excitability, and thus be productive of more rapidly fatal consequences.

b. *Crural Phlebitis.*

Synon. Phlegmatia dolens, Ph. lactea, Ph. alba dolens puerperarum, Anasarca serosa, Ecphyma œdematicum, Ecchymoma lymphaticum, Ischias à sparganosi, Sparganosis puerperarum, Leucophlegmasia dolens puerperarum, Hydrophlegmasia textus cellulosi, Œdema puerperarum, Œ. lacteum, Sceloncus dolens puerperarum, White leg, Swelled Leg, White swelling of lying-in Women; *Fr.* Œdème des nouvelles accouchées, Œdème douloureux des femmes en couche, Dépôt laiteux sur la cuisse, Enflure des jambes et des cuisses de la femme accouchée, Engorgement des membres abdominaux à la suite des couches; *Ger.* Weisse Schenkelgeschwulst der Wöchnerinnen.

The nature of this affection, to which lying-in women are almost solely liable, has been a topic of contention among pathologists; and it is only of late years, that the majority of observers have agreed to refer it to the head of crural phlebitis, to which it would appear to belong.

Diagnosis.—At a longer or shorter period after delivery, but generally within the month, pain or some degree of uneasiness is felt in the hypogastric, lumbar, or inguinal region, with slight fulness at the upper part of the thigh, which increases and extends downwards so as to implicate the labium of the same side. Generally, the enlargement of the limb takes place gradually, but at times it attains twice the size of the other in the course of 30 hours from the first feeling of uneasiness. Commonly, two or three days elapse before it reaches its greatest dimensions, when the limb is found to be tense, somewhat elastic, of a white colour, shining, hot, and extremely painful—particularly on pressure, or on motion, so that the patient can obtain no rest. Generally, the disease is confined to one extremity. It rarely happens, that both sides are affected simultaneously; but, occasionally, after the affection has left one limb, it attacks the other. The swelling has, at times, appeared as early as 24 hours after delivery, and at others, not till five weeks afterwards. The accompanying fever, which is of a hectic character, usually declines at the end of a fortnight or three weeks; but in some cases it runs on for six or eight weeks, and the patient becomes greatly emaciated. The first appearance of improvement generally occurs in the part where the affection commenced—in the groin;—the pain and tumour gradually subsiding. The amendment is progressive, but very slow; and, in many cases, the limb continues weak, and remains through life larger than its fellow.

Crural phlebitis occurs also during pregnancy; it has been seen in the unmarried and unimpregnated female, and it does not seem to be confined even to the female sex. It appears to attack lying-in women under all circumstances; occurs in all seasons and situations, and has never been observed in any other part of the body than the lower ex-

tremities. It takes place, too, in all conditions of the lochial and lacteal secretion.

Causes.—These will be best understood by a consideration of the

Pathological Characters.—The irrational views at one time embraced regarding the nature of phlegmatia dolens are sufficiently shown by the names *œdema lacteum, dépôt laiteux*, and *phlegmasia lactea* once appropriated to it, which indicate, that the disease has been conceived to be owing to a translation of the milk, which was imagined to be infiltrated into the limb, and to account for the whiteness and other characters of the swelling. After this, the affection was generally referred to some morbid condition of the lymphatics of the diseased side; but the supporters of this doctrine differed as to the precise nature of such morbid condition. The view has been most commonly embraced—that there is lymphatic inflammation, *lymphangeïtis* or *angeioleucitis*, accompanied by an effusion of coagulable lymph—not an effusion of the lymph of the lymphatics by a rupture of their coats, as imagined by some.

In the year 1823, M. Bouillaud of Paris, and Professor D. Davis of the London University, first drew the attention of the profession to the fact of crural phlebitis being present in those cases. In a fatal case, that occurred in Dr. Davis's practice, the dissection of which was made by Mr. Lawrence, no distended lymphatics or diseased lymphatic glands were found, but the crural vein was diseased, thickened, and its cavity obliterated by an organized coagulum, and a matter which appeared like pus. Since that period many observations of fatal cases have been made, which have seemed to confirm the view of Dr. Davis.

A similar affection appears to have been induced in the male by tying the saphena vein for the cure of varix. All the phenomena of phlegmatia dolens supervened. The man recovered. An anomalous case from tying the same vessel occurred to Sir A. Cooper. A male patient, according to Dr. Mackintosh, was operated on in the Westminster Hospital; phlegmatia dolens took place in the other limb, and after death the disease was traced from the vein of the stump, which became inflamed soon after the operation. The disease ascended along the vessels so as to affect the iliac portion. After reaching the bifurcation of the vena cava, the inflammation extended down the iliac vein on the opposite side, which was found thickened, and contained the kind of plug observed in Dr. Davis's case. Recently, M. Blandin has recorded a case of spontaneous phlebitis, occurring in a labourer, which exactly resembled phlegmatia dolens.

In crural phlebitis, occurring in women not in the puerperal state, the disease appears to have arisen from suppressed menstruation, malignant ulceration of the os and cervix uteri, as well as from other organic affections of the uterine apparatus. It is affirmed, too, by Dr. Lee, that the disease has occurred in the male, commencing either in the hemorrhoidal, vesical, or some other branch of the internal iliac veins, in consequence of inflammation or organic changes of structure in one or more of the pelvic viscera, but most frequently excited in the superficial veins of the leg, whence the mischief extends upwards so

as to involve the great venous trunks of the thigh and pelvis. It would seem, consequently, that all the phenomena of phlegmatia dolens may be produced by inflammation of the large veins of the pelvis, which are concerned in receiving the blood from the pelvic extremities; the inflammation giving rise to obstructed circulation, and to the effusion of the watery parts of the blood through the parietes of the veins, or to a secretion of sero-albuminous fluid, which occasions the tumefaction, &c., of the limb. At the same time, it must be admitted, that this condition of the venous system may not be the only cause; and perhaps it may be occasionally induced by the disease of the lymphatics. An opinion of M. Velpeau, expressed before the *Académie Royale de Médecine* of Paris, is, that the disease most frequently commences by an inflammation of the deep-seated lymphatics of the limb in which the œdema occurs; and on the same occasion M. Andral stated, that in certain cases he had verified the cause to be inflammation of the lymphatics; but the œdema from such a cause was slight. On the contrary, when phlebitis was present, the œdema was considerable, and the pain acute. In the great majority of cases, the painful engorgement was owing to the obliteration of veins previously inflamed.

M. Grisolle regards the disease as a species of essential dropsy—an unusual secretion into the cellular tissue, under the influence of causes still undetermined. He considers the opinion, that it is merely a phlebitis as one of the least founded,—no signs of absorption and infection being observed during life, as is almost always the case in venous inflammations. Moreover, the œdema proceeds from above downwards, or in the opposite direction to that in which it could occur, if it were owing to an obstruction of the veins.

In a case, which was accompanied with fever, and which occurred in a woman, aged 21, six weeks after delivery, MM. Becquerel and Rodier found a considerable diminution of the blood-corpuscles—92·6; and an augmentation of the fibrin—4·2.

Treatment.—At one time, repeated and copious bleedings were highly recommended, and there may be cases in which general bloodletting may be serviceable; but, in by far the majority of cases, it will be sufficient to employ topical bloodletting, and in many cases there is so little vesicular excitement, and, at times,—on the other hand,—so much prostration of strength, that the abstraction of blood from the general system is a very questionable remedy. Whenever fulness, with pain augmented by pressure, is experienced in the inguinal region, with incipient tumefaction, two or three dozen leeches should be applied above and below Poupart's ligament, and the bleeding may be encouraged by warm fomentations, or the application of a warm bread and water poultice, over the leech-bites, which acts as a fomentation. Should the pain not be decidedly relieved, the application of leeches may be repeated, and in numbers proportionate to the intensity of the disease, and the evidences of vascular excitement; and this may be over and over again necessary, should the symptoms demand it.

The contra-stimulant use of tartarized antimony has been advised,

where the necessary tolerance exists;[a] but should vomiting follow each dose, it must be discontinued.

[a] R.—Antim. et potass. tart. gr. xij.
Mucilag. acaciæ f℥iij.
Aquæ f℥vj.—M.
Dose, a tablespoonful, every two hours.

In contra-stimulant doses, it has been regarded as a powerful means of saving bloodletting. Where the necessary tolerance does not exist, the antimony may be given according to the form prescribed above, diminishing the quantity of the tartrate in the mixture to two grains, until its nauseant effects are exerted.

The use of digitalis[a] is said to have been followed by good results, yet the testimony of some observers would not induce us to expect much from it, either in uterine or crural phlebitis.

[a] R.—Tinct. digit. gtt. xxx.
Mucilag. acaciæ f℥iij.
Aquæ f℥ivss.—M.
Dose, one-third, three times a day.

The employment of mercury as a revellent has been advised, and especially calomel combined with opium. As the bowels are often disordered, no better remedy can be suggested; and the revellent operation of the mercurial can scarcely fail to be beneficial; whilst the opium relieves the pain.

R.—Hydrarg. chlorid. mit. gr. j.
Pulv. ipecac. comp. gr. vj.—M. et divide in pil. ij.
A dose, night and morning.

Should the mercury excite the slightest action on the mouth, it must be discontinued, and relief from pain be obtained by the opiate singly.

As to the local applications to the limb,—during the early period of the disease, they may consist—as before remarked—of warm fomentations; but some derive more advantage from the use of cold, or a tepid evaporating lotion.

R.—Alcohol.
Liq. ammon. acet.
Aquæ aā f℥iv.—M.

When the active stage has passed away, and the limb remains tumefied, great uneasiness may still be experienced from congestion of blood in the veins, which may be relieved by the application of leeches. In those cases of phlegmatia dolens, that are unquestionably crural phlebitis, no remedies can afford entire relief, until the collateral circulation is established. Prior to this, according to Dr. Lee, mischief has been found to result from too early recourse to remedies intended to promote the absorption of the effused fluid. When there is reason to believe, that this is accomplished, blisters may be applied so as to occupy both the lower part of the abdomen and the upper part of the thigh; protracted frictions, too, may be used, either with the hand, dipped occasionally in flour to prevent abrasion, or with a stimulating liniment.

R.—Linim. ammon. mit. f℥iss.
Tinct. opii f℥ss.—M. or
R.—Linim. saponis f℥j.
Tinct. cantharid.
——— opii aā f℥ij.—M.

Mercurial ointment, and an ointment of the iodide of potassium, have been recommended by some; but they have not seemed to be more efficacious than ordinary counterirritants.

It is at this latter period of the disease, that bandages, carefully applied over the whole limb, afford essential relief, by supporting the distended integuments, and favouring the absoption of the effused fluid. In the early period, the diet must be that adapted for febrile and inflammatory diseases in general; but, in the latter stages, one more generous may be permitted. The preparations of the farinacea,—as arrow-root, sago, &c. with milk,—may be allowed throughout.

The debility, which is left in the limb, must be met by a perseverance in frictions, sea-bathing, change of air, and every means that can improve the general health.

II. ULCERATION, PERFORATION, DILATATION, OBLITERATION, OSSIFICATION, &C., OF VEINS.

The veins are liable to the same lesions as the arteries, but, with the exception of dilatation, and perhaps obliteration, to a less degree. Some of these are the results of previous inflammation; but others may occur independently.

a. *Ulceration and perforation of veins.*—Mention has been made of suppuration as a consequence not only of ordinary phlebitis, but also of uterine phlebitis. Ulceration is another of its sequelæ. It begins in one or more points of the lining membrane, whence it may extend to the other coats, so as to cause perforation and copious effusion of blood,—the more serious according to the size of the vessel, and the part of the body in which it is situate.

Ulceration and perforation are rarely perhaps the cause of hemorrhage. Pathological observations show—as elsewhere remarked—that in the most violent cases of hemorrhage, the vessels are not often ruptured. Congestion has occurred in the vein; its parietes have perhaps become softened; and under these combined causes, if the circulation be suddenly and inordinately excited, transudation of blood takes place from the interior to the exterior of the vessel.

b. *Dilatation of veins.*—Of this we have striking examples in the veins of the lower extremities and the testicles;—constituting the surgical diseases of *Varix*—the *Phlébectasie*, of Piorry—and *Varicocele*. Occasionally, they are observed in an over-dilated condition in other parts of the body. Constant standing or active exertion in the upright posture; and, in females, the pregnant state, which prevents the ready return of blood by the veins of the lower extremities, may give occasion to this morbid condition. Under the circumstances last mentioned, the author has seen the distension, and the impediment to the return of the blood so considerable, that the varicose vessel has given way, and the life of the patient has been threatened from the hemorrhage. There is great reason for the belief, that overdilatation of the vessels of the portal system is induced, at times, by disease of the liver, which prevents the free circulation of the portal blood in that viscus; the consequence is, that the portal veins may become distended to their radicles in the stomach and intestines, and hæmatemesis or melæna be

the result; or transudation of the watery portion of the blood may take place through the parietes of the distended veins, so as to cause ascites or dropsy of the peritoneum.

c. *Obliteration of veins, Phlébectiarctie* of Piorry.—It has been already remarked, that this, also, may be, and commonly is, the result of phlebitis. The inflamed sides of the veins may unite together, or they may be obstructed by fibrinous or other concretions. Numerous cases of obliteration of even the large veins—as the vena porta and even the vena cava—are on record; yet the mischief has not been diagnosticated during life. In a case which fell under the author's care, and in which the prominent symptoms were those of jaundice, the vena porta, at its bifurcation, was found to be completely filled with encephaloid matter, so that no blood could pass through it to the liver.

The jugular veins have been found obliterated on dissection; yet no symptoms have indicated the lesion during life. This is owing to the collateral circulation being, in general, speedily established. In other cases, however, the phenomena, referred to under the last head, present themselves.

Obliteration of the vena cava and of the portal vein gives rise to ascites; whilst obliteration of the veins proceeding from the extremities occasions œdema of the corresponding limb.

d. *Ossification, &c. of veins.*—Calcareous depositions have been observed in the parietes of the veins, but not so frequently as in those of the arteries. Loose concretions have likewise been occasionally met with. These have been termed *phlébolites* or "vein-stones." They vary in size, are of a yellowish, brownish or bluish colour, and of a hard brittle consistence. They vary likewise in number; at times, being solitary, or rarely more than two or three. They are most frequently, perhaps, found in the pelvic veins. Like other calcareous concretions, they are composed chiefly of phosphate and carbonate of lime, and would seem to be deposited from the blood.

Treatment.—As these various affections of the internal veins cannot be diagnosticated during life, it is impossible to lay down any definite plan of treatment. The indications must be formed from the symptoms,—bearing in mind, that certain of the phenomena, which are common to different morbid conditions, may be owing to one of these lesions. When they occur in vessels that are external, they fall under the domain of surgery.

SECTION IV.

DISEASES OF THE INTERMEDIATE OR CAPILLARY VESSELS.

The capillary, or intermediate system of vessels is most important in both its physiological and pathological relations. It is between the part of the artery that ceases to be visible, and the earliest perceptible radicle of the corresponding vein, that the change from arterial into venous blood occurs,—a change which marks the nutritive action that has been exerted upon the blood, and at the same time exhibits the im-

portant agency of the capillary vessels. On the precise anatomical arrangement of those vessels, obscurity still exists. The author has elsewhere (*Human Physiology*, 6th edit. ii. 84, Philad. 1846) expressed the opinion, that some of the arteries proceed, by continuity of vessel, to open themselves into corresponding veins; but that others, perhaps, pour their blood into a spongy tissue, as a river pours its water into a marsh, from which corresponding veins arise;—that, in other words, in the very intimate tissue of organs, the vessels cease to have coats, so that when the blood comes in contact with those tissues, an affinity is exerted, under the influence of vitality,—the blood parting with certain of its elements, to be inservient to the nutrition of the tissues, and the tissues themselves rendering up to the blood matters which have to be eliminated. Without such an arrangement of the minute arteries and veins, it is difficult to understand how the nutrition of the tissues could be accomplished. The idea of pores in the sides of vessels has, indeed, been entertained, but it would be difficult to understand how the various heterogeneous substances could, in this manner, be separated from the blood.

In passing through this extremely minute capillary or intermediate system, it is easy to comprehend how obstructions may arise, and these obstructions are the source of many of those phlegmasiæ of the different organs described in this work. In different experiments, that have been made by injecting coarsely powdered and oleaginous substances into the blood-vessels, the mischief has arisen from the very minute vessels having been clogged up by the matter of the injection. It would appear, too, that if the blood be greatly deprived of its fibrin, it escapes from the vessels, and is the source of a different kind of obstruction, but quite as real as in the former case.

It has been a question with physiologists, whether there be any action of the capillaries distinct from that of the heart. Whilst some are of the former opinion, there are others who still embrace the latter, It appears to us, however, that the phenomena of inflammation are sufficient evidences of independent action of those vessels; but if this be doubted, it must certainly be admitted, that the greater or less activity of nutrition in a tissue must influence the quantity of blood sent to it. In other words, nutritive irritation may exist, which demands a greater supply of blood—the pabulum of all nutrition. In like manner, any source of irritation—as will be seen presently—is the source of a greater afflux of blood to the capillary vessels, which may thus become over-distended and obstructed, and be the cause of excitement or increased action in the vessels that communicate with the over-distended and obstructed capillaries.

Perhaps, in strictness of classification, most diseases ought to be ranged under diseases of the capillary vessels. Certainly, there is no spontaneous morbid condition of any tissue in which they are not the parts implicated. A different classification has been adopted in this work, for convenience of description; and it would, perhaps, be impracticable to form any satisfactory arrangement on the other basis. Hyperæmia and inflammation belong, however, so essentially to the capillaries, wheresoever situate, that it is desirable to treat of them

generally in this place. The hyperæmiæ and phlegmasiæ of special organs are referred to elsewhere.

I. HYPERÆMIA.

Synon. Hyperhæmatosis, Hyperhæmia, Congestion, Local Plethora; *Fr.* Hyperémie, Angiohémie, (*Piorry;*) *Ger.* Blutanhaufung, Blutüberfluss.

The term *hyperæmia* has been introduced into modern medical terminology to signify—an accumulation of blood in the capillary or intermediate vessels, as polyæmia signifies general plethora, or fulness of blood in the general system. Pathologically, it has been employed by a distinguished modern pathologist, M. Andral, to include inflammation,—a term which, he remarks, "has become so vague, and its interpretation so arbitrary, that it has, in reality, lost all value, and is like an old coin with the stamp effaced, which ought to be thrown out of circulation, as it can only cause error and confusion." "Inflammation," he adds, "can no longer be regarded as the expression of a complex phenomenon, which comprises several other phenomena, whose dependence is neither necessary nor constant." In the sense in which hyperæmia is used in this work, it signifies simply—an increased quantity or congestion of blood in the capillary vessels, no matter on what cause dependent.

The term *congestion* has been long employed in medical language without any definite ideas being attached to it, and we daily hear of congestions of several of the internal organs, without that precision of thought which ought to prevail with the well-informed pathologist. It is a kind of cabalistic expression, which is, nevertheless, received, in too many cases, as an evidence, that the speaker is acquainted with the pathological condition of the organ to which it is applied. It is obvious, that in order for engorgement or congestion of vessels to take place, at least two opposite states may exist;—either the arteries may carry to the affected capillaries the blood in too large quantity, or the action of the veins—the vessels of return—may be impeded. In either case, hyperæmia is induced; but, in one case, it is the hyperæmia af activity, and in the other of inaction; and the remedy indicated can be by no means the same in both cases. The author well recollects the confusion into which a respected friend, who had not thought profoundly on this matter, was thrown, on the occasion of a discussion before a medical society on the then especially interesting subject of cholera, by a question, in relation to this matter, innocently put to him. After an examination of many of the views that had been promulgated on the subject, the speaker expressed his decided opinion, that the pathology of cholera consisted in a congested state of the gastroënteric mucous membrane. The author inquired for his own information, whether by congestion, in this case, it were meant that the blood was sent in too great activity and quantity to the membrane, or that the engorgement of the capillaries was owing to diminished action on the part of the veins. His friend was unable to reply; and exhibited so much embarrassment and confusion, as to show very clearly, that the term had been used by him—in the manner in which it is too frequently used—without any definite meaning.

It need scarcely be said, that the second form of congestion, described above, is what is usually termed *venous*, a pathological condition which has given rise to much discussion at all periods.

The divisions of hyperæmia that have been made by M. Andral are as follows:—1. Hyperæmia by irritation, active or *sthenic*. 2. Hyperæmia from defective tonicity of the capillary vessels, passive or *asthenic ;* 3. Hyperæmia owing to obstacle in the venous circulation, or *mechanical ;* and 4. Hyperæmia, which does not take place until after death, or *cadaveric*. Under the two first divisions he includes sthenic and asthenic inflammation, as they have been occasionally termed. The consideration of these will fall under the next head. It may be remarked, however, that although—as will be seen—hyperæmia must be regarded as a concomitant of all inflammations ; it may exist independently of any inflammation ; and hence, in the course of this work, hyperæmia of an organ is treated separately, and distinctly from the phlegmasia or inflammation of the same. It rarely, perhaps, happens, that active hyperæmia occurs without the phenomena of inflammation following, and the same may be said of passive or asthenic hyperæmia, especially if seated in parts where the vessels are but loosely protected, as in the mucous membranes. "Sthenic hyperæmia," says the writer just cited,—"is one of the degrees of what is called *Inflammation :* it is one of the elements of this complex phenomenon. Asthenic hyperæmia, regarded in its nature and causes, is entirely different. It approximates the condition, which has long been designated asthenic *inflammation*, an expression which ought to be discarded, inasmuch as *inflammation* and *asthenia* imply a contradiction." M. Andral properly adds, however, that the expression was probably first embraced, in consequence of their being morbid states, which yield to a more or less stimulating system of medication ; although, as regards the anatomical characters, these states are exactly like others, which cannot be combated successfully except by antiphlogistics.

In all cases of augmented secretion from an organ, or of increased nutrition in any part of the economy, there is a greater afflux of blood to the vessel concerned, and a consequent congestion or hyperæmia. This, however, may be healthy ; but the hyperæmia—now under consideration—exceeds the healthy limits, and gives rise to local disturbance of function. It is easy to see, however, that any inordinate augmentation of the natural secretory or nutritive action may give rise to morbid phenomena. In like manner, passive congestions may take place, which may interfere little or not at all with the healthy actions—as where mechanical pressure is made, which impedes or prevents the return of the blood to the heart ; and it is a wise provision, that the effects of such retardation are devoid of injury when within certain limits ; and that morbid congestions do not often result from such pressure, in consequence of the numerous anastomoses between the different veins. When, however, congestions occur that are unquestionably morbid, they give rise to phenomena, which are not always easy of appreciation.

Diagnosis.—Where the parts are visible, the evidences of hyperæmia can be readily appreciated : there is redness of various shades, ac-

cording to the greater or less activity of the congestion. Inflammation of the fauces, in its early stage, exhibits these various appearances, according to the character of the inflammation. When very active, the parts are of a vivid red; when more of the asthenic form, they are dusky; and vessels of a larger size containing black blood, may be seen distributed over the mucous membrane. That, which applies to inflammation of those parts, applies equally to the stage of hyperæmia, which precedes the inflammation. Along with the red colour, there is always more or less tumefaction, owing to the engorgement of the capillaries.

When the hyperæmia concerns deep-seated parts, it may be impracticable to detect it, except by a process of reasoning founded on the derangement of function induced by it. In all cases, there is tumefaction; it is, indeed, impossible to conceive the existence of an increased quantity of blood in the capillaries of an organ, without there being increased size of the organ; yet in many of the internal organs—the encephalon and lungs for example—this cannot be detected by any external examination. In others,—as the liver and spleen,—it may be discovered where the congestion is considerable.

The diagnosis of internal hyperæmia being chiefly dependent upon the disorder of function of the organ implicated, it must obviously be obscure. There is not, indeed, any functional phenomenon, which can be esteemed pathognomonic, and it is owing to this very obscurity, that the unreflecting pathologist finds it easier to invoke the existence of congestion in a difficult case, than by laborious investigation to endeavour to detect the true pathological condition. Dr. Macrobin gives the following as the most prominent of the symptoms of local congestion:—sensations of chilliness, languor, depression of spirits, lassitude, and sense of muscular debility, coldness of the extremities, with occasional paroxysms of excitement of the heart and arteries, assuming, at times, the form of an irregular and imperfectly developed pyrexia: but none of these symptoms are distinctive, and they may be all present in disordered conditions of internal organs, which may partake more of inflammation than of congestion. It is, indeed, impracticable to distinguish between the two conditions in many cases.

The terminations of congestion are more interesting to the pathologist than the congestion itself. It is a precursor—as has been shown—of inflammation in almost all, if not in all, cases. It is easy to see, also, that distension of capillary vessels cannot continue in any organ, without materially interfering with its functions; and in some cases, without abolishing them—for a time or permanently—as in the case of apoplexy induced by hyperæmia of the encephalic vessels. When to a less extent in these vessels, epilepsy, mania, &c., may be the resulting affections. In other cases, the hyperæmic state of the vessels may lead to an augmentation of the secretions; whilst in others, again, the secretions may be for a time diminished or arrested, and subsequently greatly increased. It can be equally understood, that the hyperæmia may be the source of nutritive irritation in the organ, so that hypertrophy, either of the natural structure of the organ or of a morbid kind, may be induced; and lastly, in constitutions predisposed to such for-

mations, tubercles or some of the other heterologous tissues may be developed.

Causes.—Polyæmia or fulness of blood is generally considered an important predisponent cause of hyperæmia, and it doubtless may be so. In such a condition of vessels, any source of irritation occasions a ready afflux of blood into the capillaries, which generally lays the foundation for inflammation. The opposite condition of paucity or unusual thinness of blood equally, however, predisposes to it. The great liability to this pathological state in anæmia demands, indeed, the most watchful care on the part of the practitioner.

In proportion as the blood is diminished in quantity, or loses its healthy proportion of solid constituents, the impressibility of the frame becomes augmented, and irregularities of circulation are apt to supervene, which give occasion to hyperæmia. This is well exhibited in cases of uterine hemorrhage. After the patient has been rendered almost exanguious, reaction takes place, and in the course of a few hours, the practitioner may be called to relieve phenomena that indicate hyperæmia of the encephalon,—as throbbing of the carotid and temporal arteries, intense cephalalgia, accompanied by suffusion of the face, and every evidence of active congestion, or what is often called *determination of blood to the head.* This pathological state has been induced in the mode just described: under the inordinate loss of blood, the nervous impressibility becomes irregularly developed; and, in the case in question, affects the vessels of the encephalon most prominently. The consequence is—hyperæmia of those vessels, which is not to be removed by farther abstraction of blood, but by sedatives, —such as opium,—which will allay the impressibility, and exert an equalizing and soothing operation.

That which applies to uterine hemorrhage and its sequelæ, applies equally to loss of blood, howsoever induced; and, hence, the well-informed therapeutist, while he reduces the amount of the stimulus or of the blood, where such reduction is indicated, is careful not to carry it to such an extent as to develope nervous impressibility, but rather to combine with the bloodletting sedative agents, which are adapted both for allaying vascular excitement and suppressing nervous erethism.

The ordinary causes of inflammation are of course causes of hyperæmia, which—as has been seen—is the precursor of inflammation; hence irritants of all kinds are concerned in the etiology of both. A sedentary life, especially if the individual indulge too much in diet improper by quantity or by quality,—perhaps, even, the constant retention of the same position of body,—may interfere with the general distribution of the blood, and cause its accumulation in particular parts. It is well known, that fistula in ano is so common amongst tailors, that they have, in London, a fistula club. This is, doubtless, owing to the capillary circulation of the part being modified by constant pressure, and continuance in the same sedentary posture. All impediments to the circulation of the blood in internal organs are causes of hyperæmia; hence it is, that induration of the liver is so frequent a cause of congestion of the portal vessels, and, consequently, of ascites, or hæmate-

mesis; and that hæmoptysis is a common result of tuberculous formations in the lungs.

Hyperæmia generally takes place very readily, where the vessels are loosely protected by the parts in which they creep; and can, consequently, become readily distended when any source of irritation gives occasion to greater afflux of blood to them by the arteries, or any cause prevents the ready return of the blood by the veins. The mucous membranes are, accordingly, frequent seats of hyperæmia and hemorrhage. The lungs, brain, uterus, and kidneys, which receive a large quantity of blood, are likewise liable to hyperæmia under favouring causes.

Pathological Characters.—The evidences of hyperæmia on dissection may be null, and yet it may nevertheless have existed during life; and, on the other hand, hyperæmia may be clearly apparent, which may have taken place at the time of dissolution, and even afterwards. Hence it is, that its signs during life cannot be determined with any thing like certainty; and hence, also, the encouragement for invoking this pathological condition in obscure cases.

Where simple hyperæmia exists during life, unaccompanied by inflammation, the capillary vessels may be empty after death, so that the morbid condition may not be perceptible; and, on the other hand, during the last movements of the circulating fluid, accumulations may take place in depending parts of the body, which can, in no respect be esteemed morbid. This *hypostatic* hyperæmia, observed in depending portions of the body, is equally observed in the internal viscera; the lowest portions of which may exhibit a congested state of the vessels, whilst the upper are comparatively devoid of blood. This is well seen in the lungs and intestines.

The kind of death has likewise a marked influence in the production of hyperæmia. Thus, where death has taken place—as in asphyxia—from nonconversion of venous into arterial blood, and consequent stagnation in the pulmonary radicles, the right side of the heart, and the vessels communicating with it, are engorged with blood, and the evidences of it are marked on dissection.

Where the hyperæmia has been accompanied by inflammation, the appearances—as will be seen hereafter—are less equivocal: generally, they cannot be mistaken; but in simple hyperæmia—considered to be such during life—the evidence may be by no means satisfactory. Dr. Macrobin affirms, that the evidence of the existence of an actual and pathological congestion as derived from *post-mortem* examination can only be satisfactory under the following circumstances—many of which apply equally to inflammation:—*First.* The appearance of an increased vascularity and redness is not altogether confined to depending situations; but when, on the contrary, the minute arteries and capillaries of the superior and least dependent portions of a membrane or organ are found highly injected; for example, the edges of the upper surface of the lungs, the superior part of the gastrointestinal mucous membranes, or of the membranes investing the anterior and superior portions of the brain. *Secondly.* When the vascularity is not limited to veins, or to branches of arteries whose diameter in the

natural state might be considered of sufficient size to circulate red blood; but where, on the contrary, the very minute and delicate colourless vessels are found penetrated with red blood. *Thirdly.* When the redness is of the florid or arterial hue rather than of the dark venous shade—the latter being more characteristic of turgescence of the venous system; that is, of a congestion which is the consequence of a stasis of the blood from the force of gravitation, or from a mechanical obstruction to the circulation, (the simple *hypostatic* and *mechanical* congestions.) *Fourthly.* When, in the absence of any unusual vascularity or injection of the capillary vessels of a part, there is found to be a more than ordinary quantity of a serous or bloody fluid deposited. *Fifthly.* When, looking to the posture of the body generally, and of the different viscera in particular, as well before as after death, there is no ground for supposing that the position could have materially favoured the formation of a hypostatic congestion. And *lastly.* When all the foregoing particulars coincide, and when, by a careful review of all the symptoms during life, and consideration of the manner of the patient's death,—that is, whether it was sudden or gradual—in the way of asphyxia, coma, or simple exhaustion—there is no contradiction in, but, on the contrary, a confirmation of, the preceding evidences.

It is in consequence of hyperæmia being so apt to occur where the functions of innervation and circulation are grealy disordered, that the practitioner has to be on the watch in long protracted fevers, the danger of which is, indeed, greatly dependent upon the occurrence of hyperæmia or of inflammation in some internal organ.

Treatment.—As it is extremely difficult to diagnosticate the existence of hyperæmia, so is it to lay down any fixed plan of treatment. Where its existence is suspected it will be all important to attend to the causes that may have given rise to it. Should these seem to be of an active character, the same plan of treatment will be needed as in inflammation. Where, however, it is more of the asthenic kind, as is the case in the diseases termed *congestive*, and where the affection is induced by unusual nervous impressibility, the treatment may have to be greatly modified. In such cases, general bloodletting, if employed at all, should be so with great caution; and it may be necessary—as remarked under Congestive Fever—to employ excitants at the same time;—the bleeding acting revulsively, and attracting the blood from the congested organs, whilst the excitants tend to diffuse the blood towards every part of the organism, and thus to exert an equalizing operation. General bloodletting rarely, however, effects this salutary revulsion as well as local bloodletting, which is appropriate in almost all cases of hyperæmia; and where it is not, or is considered to be doubtful, excitants may be exhibited internally, and counterirritants or sinapisms be applied externally. The hot bath is in such case serviceable, or the warm bath of such a temperature (92° Fahr.) as will tend to equalize the circulation on the surface.

Where the hyperæmia is dependent upon nervous erethism, this may have to be allayed by opiates and sedatives generally, of which the hydrocyanic acid is one of the best, and every attention must be paid

to avoid nervous agitation or disquiet. The indications applicable to all cases of hyperæmia are, indeed, to avoid all sources of irritation—physical and moral; and, where the tendency is obstinate, to endeavour, by change of air, society and scenery, to excite new impressions, which will frequently, by their revulsive agency, restore the individual after other remedies have been tried in vain. This course is equally indicated after the hyperæmia has been removed.

Should the hyperæmia be dependent upon or accompanied by polyæmia or plethora, the diet should be spare; and in all cases it should be of such a nature as not to endanger vascular fulness or over-action. With this view, abstinence from fermented liquors of all kinds is essential. The cases must be few where they can be demanded.

The special phenomena and treatment of hyperæmia, when it affects particular organs, are described under the appropriate heads.

II. INFLAMMATION.

Synon. Inflammatio, Incendium, Phlogosis, Phlegmone, Phlegmasia, Hyperhæmatosis, Angiite, (*Piorry*;) *Ger.* Entzündung.

If the condition of hyperæmia be interesting to the pathologist,—as the cause of many phenomena, explicable with difficulty, which are presented by various organs,—that of inflammation is still more so. It is always, indeed, a topic of paramount interest to the practitioner, when called to a case of disease, to investigate whether there be inflammation or not; and where the surface of the body only is implicated, the diagnosis is sufficiently easy. The affection then belongs to the class of *morbi externi*, and is generally considered to be in the domain of Surgery. It is only, therefore, internal inflammation, that properly enters into the province of this work; but still, some remarks may be necessary, that will apply equally to inflammation wherever it presents itself.

With some pathologists, the disposition exists to refer almost all morbid conditions to inflammation preceding or existing; and the mistake is doubtless often made of assigning diseases to it in which it may be little, if at all, concerned;—for example, the different accumulations, which occur in shut sacs and constitute dropsies; the various forms of hypertrophy, and of hypercrinia or increased secretion, &c.; yet still, if the list of diseases treated of in this work be rapidly run over, it will be seen, that inflammation plays a most important part in many of them. Under those diseases, the phenomena and treatment of special phlegmasiæ have been described. Here, it will be necessary to consider those of inflammation in general.

It has been already remarked, that hyperæmia or simple congestion or distension of vessels is the precursor of inflammation; and it has been shown that the former affection may pass away without the supervention of the latter. In order that the hyperæmia may be followed by inflammation, it would seem to be necessary, that the blood should accumulate in such quantity as to over-distend the capillary vessels; the consequence of this over-distension is atony of the capillaries, which are incapable of emptying themselves of their contained blood. In some cases, the blood coagulates, and, owing to the ob-

struction of the capillaries, in all cases, a morbid nutritive process is set up; changes occur in the vessels themselves, as well as in the cellular texture surrounding them; the vessels, immediately communicating with the over-distended capillaries, take upon themselves increased action; effusion of fluid occurs; and, where the inflammation is extensive, or seated in parts that are of great importance in the organism, the constitution sympathizes, and fever of greater or less severity ensues.

From this brief narration of the phenomena of simple inflammation, it will be obvious how impracticable it is to give any definition of it that can be satisfactory. As has been remarked by M. Magendie, "a whole book might be made of the ideas represented by the word inflammation, for it is synonymous with 'disease.'" Yet, although the term has been vaguely employed, a consideration of the pathological phenomena may enable us, perhaps, to approach its proper acceptation. With this view, it will be convenient to inquire briefly into the

Pathological Characters.—The observations, which have been made with the microscope, on the phenomena that accompany and constitute inflammation, have been very numerous, and are detailed in various essays on inflammation. In no part of this work has it been the desire of the author to detail the various views that have been from time to time entertained on the different topics discussed, but rather to give the existing state of knowledge on the subject. He will not dwell, therefore, upon the different and discordant opinions of observers, but confine himself to what he considers the most authentic results.

When any irritating agent is applied to a part, the flow of blood through it appears to be accelerated; the arteries convey the blood more freely to it than in the healthy condition, and the fluid is seen to flow irregularly, and often in a retrograde direction, and in channels which were not previously observed. Soon afterwards, if the part be examined by the microscope, the extreme vessels appear to be distended, and in an evident state of hyperæmia. The flow of blood is next evidently retarded, and in some of the vessels wholly arrested; —owing partly, it would seem, to the coagulation of the blood, and partly to the atonic condition of the coats of the extreme vessels. It has been affirmed by Mr. Addison,—and a writer in the *British and Foreign Medical Review* for July, 1843, states, that he had verified the observation,—that in the passage of the blood through the capillaries, the corpuscles pass in single file; some of these occasionally turning aside, as it were, from the current, and for a time attaching themselves to the parietes of the vessel—the succeeding corpuscle passing round or rolling over them. In the inflamed or irritated state of the same capillaries, the corpuscles rush in greater quantities through them, the calibre of the vessels being increased. The globules now pass in double and triple files even in greater quantity—the sides of the vessels being occupied by numbers in a state of stagnation, some of which, from time to time, roll off into the general current; others ad-

vancing and taking their places; until, ultimately, the vessels become obstructed, and there is a complete stagnation.

On the inner surface of the walls of the dilated capillaries, colourless corpuscles are seen to accumulate during the retardation of the flow of blood; and these have been regarded by Dr. C. J. B. Williams as new formations occurring at the moment. Mr. T. Wharton Jones, however, who has directed special attention to this point, ventures to maintain, that these colourless corpuscles, thus seen to accumulate, are no new formations called forth at the moment;—that they already exist in the blood; and that when the velocity of the stream of blood is great, the colourless corpuscles are mingled, and carried along with the red corpuscles, but when the velocity of the stream is diminished from any cause—whether one of a temporary nature or leading to inflammatory congestion—the colourless corpuscles become extricated from among the red ones, and come in contact with the walls of the vessels, where rolling slowly along, or actually remaining stagnant, they accumulate in great numbers.

Very early, transudation of the serous portion of the blood, the effect of turgescence, takes place in the cellular tissue, and soon afterwards—if the inflammation continue—the *liquor sanguinis* exudes by an action analogous to secretion; and, subsequently, in many cases, morbid secretions, as pus, are poured out, under the new affinities that take place from the deranged vital actions. It has, indeed, been well maintained by Dr. Alison, that a peculiar perversion of nutrition or of secretion ought to be held essential to the very existence of inflammation; and that "all attempts at explanation of the changes to which the term is applied, if they do not include this, their most essential peculiarity, we must regard as necessarily and fundamentally defective."

From what has already been said, it will be obviously difficult to appreciate the vital actions of the capillaries in inflammation, and impossible to adopt any explanation that can apply to all stages. The main views entertained have been three.—*First.* It has been ascribed to increased action, or to an increase in the tonicity or contractility of the extreme vessels; but a sufficient objection to this view—if what we have before remarked be correct—is, that an essential stage of the morbid process is over-distension and want of tone of those vessels. *Secondly.* It has been ascribed to a loss of tone in the vessels from the first—a view which is liable to the objection, that a larger quantity of blood certainly passes in the early stages of inflammation through these very vessels, and, therefore, they must be *active* rather than *passive.* And *thirdly.* It has been supposed, that one of the earliest phenomena is a *turgor vitalis* of the extreme vessels, under which they become expanded actively, as the heart is expanded actively during its diastole. This vital power of expansibility, or turgescence has been ascribed to the capillaries in health, but, as the author has elsewhere remarked, (*Human Physiology*, 6th edit. ii. 152, Philad. 1846,) it is not proved. The same may be said of it as applied to inflammation. The phenomena presented by the erectile tissues have been adduced in its favour; but if they be attentively studied, it will be found,

that the turgescence is not the first link in the chain of the phenomena; excitation is first induced in the nerves of the part—generally through the influence of the brain—and the afflux of fluid supervenes. This is still better observed in inflammation. If *irritation* be caused in any tissue, an afflux of fluid takes place to the part irritated; and, in consequence of such afflux, the extreme vessels become over-distended;—want of tone, as already remarked, succeeds to this over-distension; and it is not until the parietes of the over-distended vessels have recovered their tone, and emptied themselves of the stagnant blood, that the mischief ceases. In the meanwhile, important changes have taken place in the vessels communicating with the over-distended capillaries; the increased action of which may have been so great as to demand the most vigorous sedative measures.

These remarks are applicable to most cases of inflammation; but where it is owing to arrest of the venous circulation in the first instance, hyperæmia may be the first link in the chain of phenomena, and the source of the irritation, which gives rise to the increased action of the vessels. This increased action must be presumed to be present at some period of every case, and it would, therefore, seem to be the most characteristic of the morbid phenomena. It is, indeed, difficult not to agree with Dr. Macrobin, that there is in every case of inflammation an *increased action* or augmentation of the vital properties of the vessels, whatever other invisible intermediate circumstances there may be, in the part or system generally, antecedent to the increased impetus;—"a point of more practical importance for the student to bear in mind than any other, and which, although disputed by theorists, is nevertheless that which is most consistent with the whole phenomena of the disease, and at the same time safest as a principle of practice."

The pathological characters, presented by the different organs when inflamed, will be given under the proper heads.

Diagnosis.—When inflammation is seated on the surface of the body, or in any of the outlets, which can be examined by the eye, it presents, in its early stage, certain phenomena, which are termed the *local signs* or *symptoms*, and which—when the inflammation is within certain limits—may exist alone; but when they are beyond these limits, the whole organism may sympathize, and give occasion to *general* or *constitutional symptoms*. Where the inflammation is seated in an internal organ, the local signs are often of but little service; and some of them unsusceptible of detection. We have then to form our diagnosis from the general symptoms, in association with the disordered function of the affected organ.

From the earliest periods, the local signs of inflammation have been considered to be four in number,—*dolor*, *calor*, *tumor*, *rubor*,—pain, heat, swelling, and redness. It is not necessary to dwell upon the mode in which these are induced. The *pain* is admitted to be owing to the compression or distension of the nervous filaments, by the new pathological condition of the vessels and surrounding tissues. The pulsatory pain in inflamed parts has usually been ascribed to modification of the vitality of the vessels; but it has been suggested, that the

mechanical modification experienced by the local circulation may not have been sufficiently regarded. "Whenever an artery is closed at one end, and thus presents an insurmountable resistance to the passage of the fluids into the capillary rete, its coats support very considerable pressure, and dilate under each contraction of the heart. Now this is the state of things in an inflamed part. The nerves, compressed at the instant each arterial pulsation takes place, transmit the impression to the brain; the phenomenon alluded to is therefore physical in existence, though vital in its results,—the first cause of all the disorders observed is the obstruction of the capillary vessels." The *heat* is owing to the blood passing in greater quantity, and with increased velocity, through certain of the vessels which continue permeable; the *swelling* is owing to the dilatation of the vessels, and to the effusion from them into the cellular membrane; and the *redness* is caused by the presence of an unusual quantity of blood in the vessels.

When the inflammation is seated in internal organs, the diagnosis is formed on the occurrence of constitutional irritation or fever, associated with derangement of function in the organ or organs implicated. The definition of internal inflammation, by an eminent nosologist, Dr. Cullen—Fever with fixed pain in some internal part, and deranged function of some internal organ—although applicable in general, is not so universally. Endocarditis and pericarditis may pass through their course to a fatal termination with little or no pain. The lining membrane of the stomach may be inflamed, and yet no evidence of suffering be afforded. Still, pain or tenderness upon pressure is generally a concomitant of internal inflammation. Often, however, it is not directly available in the diagnosis, as where the organ is in a cavity surrounded by bony parietes; yet it may occasionally be discovered indirectly. Thus, in pericarditis, the pain may be obscure or null, when pressure is made on the cardiac region of the thorax; and yet it may be vividly experienced, when pressure is made on the abdomen so as to force up the diaphragm, and impress a succussion on the heart. On the other hand, tenderness on pressure may be felt, when a part is not inflamed, and error is often incurred from not bearing this in mind. It is, indeed, the most marked phenomenon in hyperæsthesia, and in most of those neuropathic affections that have, of late years, been classed under *spinal irritation*. When the intestines are distended with flatus, the abdomen is at times acutely sensible to the touch; and, after delivery, tenderness on pressure is frequently felt to such a degree, as to lead to a belief in the existence of peritonitis; yet this is relieved by remedies—as opiates—which are adapted for allaying nervous erethism. It is proper, however, to bear in mind that what is neuropathic in the first instance may become inflammatory afterwards; and hence nice discrimination is often needed to detect when the morbid condition changes its character. Enteralgia, for example, which is entirely neuropathic, may terminate in enteritis, and the transition may not always be detected, except by a careful attention to symptoms, and a thorough acquaintance with the phenomena that characterize both affections. The effect of remedies aids us not a little in the diagnosis, in doubtful cases.

In neuropathic affections, there is usually but slight tolerance of loss of blood, whilst in highly inflammatory diseases, the amount of the tolerance—before syncope is induced—indicates, to a certain extent, according to Dr. Marshall Hall, the intensity of the inflammation. It often happens, too, that persons, who are liable to neuropathic affections, are at the same time liable to phlegmasiæ, or at least to active hyperæmia or determination of blood to some organ; and the author has frequently observed, that in cases of neuralgia faciei, after the pain had been excessive for some time, ophthalmia has supervened; and this has been the sequence whenever the patient has had a severe paroxysm of the former malady. It is known, too, that paralysis of certain nerves may give occasion to inflammation of organs to which they are distributed. If the fifth pair of nerves be divided in the interior of the cranium, on the petrous portion of the temporal bone, and remote from the eye, one of the effects of the section—as might be presumed—is to destroy the sensibility of the conjunctiva, so that the eye becomes as devoid of feeling as the epidermis. Ophthalmia, however, soon succeeds; so that inflammation may be produced in one case from excitement, and in another from paralysis of a nerve. In both cases, obstruction is probably induced in the extreme vessels, with modification of their vital endowments; but of the intimate nature of the irregularities thus developed in the capillary circulation we are profoundly ignorant.

As in cases of internal inflammation, there is but one of the four symptoms of external inflammation—the pain—that can be available in the diagnosis; and, as this is not always present, it is important to attend to the phenomena before mentioned—the disorder in the functions of the inflamed organ, and the degree of constitutional disturbance. Perhaps in no case can active inflammation attack an internal organ without its functions being materially deranged; and a reference to the particular diseases—gastritis, peritonitis, bronchitis, encephalitis, &c. &c.—will show how important a part these functional expressions play in the diagnosis of those important diseases. Generally, in proportion to the extent of the inflammation will be that of the general or constitutional phenomena. In high degrees of inflammation, the fever is intense, and the general disorder of functions extensive; yet, in many most dangerous maladies, which are running their course to a speedy termination in death, the amount of pyrexia may be by no means great. Such is not unfrequently the case in enteritis of the peritoneal coat, and especially in that which forms part of the morbid condition in strangulated hernia. On the other hand, the accompanying fever may be excessive in inflammation of a part, which is of but slight moment to the economy. Such is the case in inflammation of the tonsils,—a disease commonly of but little consequence, and nevertheless accompanied, generally, by great constitutional disturbance.

The fever, which accompanies the first and active periods of inflammation, belongs essentially to the synochal class, and is indeed the type of that elsewhere described as *inflammatory*. Yet inflammation may exist, occasionally, even from the onset, and frequently in the

progress of an affection, which is of the typhoid or adynamic character; of this we have examples in the irritative fever, that results from serious, and, at times, from slight, injuries in persons of unhealthy habit, and in such especially as have been accustomed to over indulgence in fermented or spirituous liquors. These cases belong to the province of surgery; yet we frequently meet with similar conditions, where inflammation attacks an internal organ, of which we have good examples in typhoid pneumonia and typhoid pleurisy, and in the inflammation which is induced by the reception of some virus into the system. These cases are less under the control of the therapeutist; *first*, on account of the impaired condition of the constitution; *secondly*, on account of the change induced in the circulating fluid, and, through it, on the capillary vessels by the peculiar character of the virus; and, *thirdly*, because the most active antiphlogistics,—those which are so effective in the sthenic or active forms of inflammation,—are inadmissible. Lastly,—it is important to bear in mind, that in persons who are greatly debilitated, and in the progress of continued fever, inflammation may be masked, or *latent*, and may even proceed to a fatal termination, perhaps without the nature of the lesion being suspected, until it has been revealed by dissection. Of this, we have an excellent example, in the disease already mentioned—typhoid pneumonia.

The state of the blood in inflammation has been long attended to, so far as regards the *buffy coat*, and the shape and character of the crassamentum. In most cases of high inflammatory action, in which the constitution sympathizes, if blood be taken in a full stream from a vein, the fibrin and red particles separate—the latter subsiding so as to form the lower part of the clot, and the fibrin forming the buff or crust at the top. In such cases, the crust is generally very firm, and the whole clot of great cohesion, and exhibiting a cupped appearance on its surface. In order that this inflammatory crust should exist, it would seem to be necessary, that constitutional symptoms shall be present; and, accordingly, in the very early stage of inflammation, it may not appear in the blood drawn, and yet be marked on blood taken at an after period,—a fact to be borne in mind by the therapeutist. Of the nature and causes of the appearance in question, the author has treated at some length elsewhere. (*Human Physiology*, 6th edit. ii. 118, Philada. 1846.) It is not only perceptible in cases of high internal inflammation, but in acute rheumatism, in the pregnant condition, and in persons of great nervous excitability. In the first of these cases, there may be no disorganizing inflammation present,—none that requires the same activity of treatment to preserve life, that pleurisy, for example, does; and in the second, the buff appears when the female is in perfect health. Perhaps, the most important fact to be recollected is, that we observe the buff on the blood of persons of great nervous excitability, even when no inflammatory condition is present; and when, on the contrary, the blood is watery,—or, in other words, does not contain the healthy proportion of fibrin and red globules. It would appear, too, that a cupped and buffed state of the blood, which might be mistaken for the pure effects of inflammation, and as an indication for the prosecution of antiphlogistic measures, is

often induced—and kept up, if already present—by the excitement and reaction of the system, which is so generally observed to follow extensive loss of blood. (See the remarks on the Morbid Conditions of the Blood, at the commencement of this "Book.")

In cases of violent inflammatory action, the crassamentum is commonly supposed to be increased in bulk, but this has been esteemed doubtful by Dr. B. Babington. The fibrin is certainly more abundant than natural. From some experiments, instituted on this point by Sir Charles Scudamore, it resulted, that in 1000 grains of the clot—obtained from eight specimens of healthy blood, the average of dry fibrin amounted to 3·53 grains; the maximum being 4·43, and the minimum 2·37; whilst the same quantity of blood, drawn in slight pleurisy, and slightly buffed, yielded 7·05 grains; in another case, 11·37 grains; in a case of cough, 7·24 grains; in acute gout, blood not buffed, but of firm texture, 5·88 grains; in a disease not named, clot compact, buffed and cupped, 12·41; and in another case of the same kind, 13·73 grains; making the average, 9·62 grains. In eight cases of inflammation recorded by another observer, Mr. E. A. Jennings, the proportion of fibrin in the blood was increased from 2·1—the standard of health, according to M. Lecanu—to 9·8, 11, 6, 5·3, 7, 6·9, 7—the average being 7·525, and the alkaline salts were diminished from 8·37, the healthy standard, to 4·9, 4·8, 5·1, 4·3, 4·2, 4·4, 4, 5·6—the average being 4·61. The serum of the blood is likewise found to contain a larger proportion of albumen than in the healthy state of the system.

All these estimates are confirmed by the investigations of MM. Andral and Gavarret, and their researches are corroborated by those of M. Simon, and of MM. Becquerel and Rodier, referred to at page 500. In acute inflammatory affections, M. Andral found an invariable increase in the proportion of fibrin, the increase being proportionate to the intensity of the inflammation, and the degree of symptomatic fever accompanying it; and he asserts, that if we find more than 5 parts of fibrin in 1000, in the course of any disease, we may positively affirm that some local inflammation exists. The average augmentation of fibrin in inflammation, he estimates at 7; the lowest at 5; and the maximum at 10½. Pneumonia and acute rheumatism are the only diseases in which he has found the proportion of fibrin rise as high as 10. There is, consequently, in inflammation, an excess of fibrin over the red corpuscles, or the reverse of what is observed in typhous fevers. Hence, the difference in the appearance of the blood drawn in these affections: whilst in fevers in general the clot is bulky, soft, and imperfectly separated from the serum; in inflammation, the clot occupies less space; is of much greater density and consistence; and if the blood have flowed properly from the vein, is covered with a buffy coat of greater or less thickness. M. Andral, therefore, approves of Meckel's definition of inflammation—"a congestion with tendency to a new production;"—that new production being, according to him, an excess in the quantity of fibrin. In proportion to the excess of fibrin the corpuscles are decreased; the fat too is increased, and in proportion to the increase of the fibrin and fat, and the decrease of the

corpuscles, M. Simon found the whole solid residue was diminished. Such are the characters which he assigns to the form of diseased blood, termed by him *Hyperinosis*. MM. Becquerel and Rodier add, that there is an almost constant tendency on the part of the solid matter of the serum, and especially of the albumen, to become diminished, and thus for a lower specific gravity of the serum to be induced. Whether the modifications in the serum be dependent upon the lowness of the diet, or upon the disease and the disturbance caused by it in the system, whereby the secretions generally, and that of the urine especially, being diminished, a larger quantity of water than usual is retained in the system, or upon these and other agencies combined, cannot be determined. M. Andral found considerable difference in the increase of fibrin according to the seat of the inflammation. In inflammation of the cellular tissue, it did not exceed 5; in pneumonia, it rose occasionally to 10, and more. In inflammations of the mucous membranes, when slight, and unaccompanied by fever, it remained in the usual quantity; but when they attained a certain degree of intensity, and were accompanied by febrile reaction, the fibrin invariably rose in amount. In inflammation of the serous membranes, the increase was more marked; and in acute rheumatism, it rose as high as in pneumonia. The increase in the proportion of fibrin appears in the blood from the time the inflammation commences. In no case was it observed in the blood before the modification of the solid that characterizes the phlegmasia was present. He properly, however, considers the question yet unsettled as to which of the two phenomena is primary, or whether they do not arise simultaneously. In the case of a burn, the blood clearly becomes affected secondarily, and analogy might lead to the belief, that the same may be the case with other inflammations. Dr. C. J. B. Williams thinks, it is pretty clear, "that the increase of fibrin, and its more contractile and separating quality, originate in the vessels of the inflamed parts, and must be regarded as an augmentation of the vital process of nutrition, developed by inflammation;" and the fact, that the ratio of fibrin is increased in pregnancy and other conditions of the system before-mentioned favours this position.

In the same manner as the appearances of the blood that are seen in many forms of active inflammation may be met with in diseases not inflammatory, it can be understood, that they may vary materially in inflammation of different tissues. They are most marked in cellular and serous inflammations—less so in mucous inflammations: this has been ascribed, and perhaps correctly, to the little pain and comparatively trifling general disturbance attending inflammation of these parts. It certainly would seem to be necessary, in order that the buffed appearance should be marked, that the nervous and vascular disturbance should be considerable. This is the case when the pleura is inflamed, and, accordingly, the blood is so much cupped and buffed in that disease, that the crust has obtained the name *crusta pleuritica*. Dr. Macrobin considers, that it may be stated as a general fact, that the contracted and sizy appearance of the blood will be most strongly exhibited,—*first*, in inflammation of serous and fibrous membranes and

their modifications; *secondly*, in inflammation of the parenchymatous or compound textures; and *thirdly*, least so in inflammation of mucous membranes. The decidedly buffed state of the blood, however, which is seen in the inflammation of the fibrous membranes, that forms part of acute rheumatism, is less perhaps dependent upon the inflammation itself than upon the constitutional disturbance that precedes and accompanies it; so that the blood may exhibit the signs of *hæmitis*—to use the language of a recent pathological writer, M. Piorry—before even the evidences of local phlegmasia are distinctly perceptible.

The remarks, just made, lead to the consideration of the phenomena presented by various tissues when labouring under inflammation. When the skin or mucous membranes are attacked with this affection, the inflammation is more of the *erythematic* or *erysipelatous kind*, and spreads over a greater extent of surface than when it implicates chiefly the cellular membrane, or is of the *phlegmonous kind*, which has been esteemed the type of *healthy inflammation*, as it has been termed,—the erysipelatous or erythematic form being more apt to occur in impaired states of the constitution, and to terminate by one of the least favourable results of phlegmonous inflammation.

It has been already remarked, that inflammation of the mucous membranes is usually of a less active kind than that of the serous membranes; and the same may be said of inflammation of the skin as compared with that of the cellular membrane. The skin and mucous membranes belong, indeed, to the same system—the dermoid; their anatomical constituents are essentially alike, and their diseases congenerous. So is it, likewise, with the cellular membrane and the serous membranes—which last are but condensed cellular membrane.

Inflammation of fibrous membranes, as we meet with it in gout, is accompanied by copious effusion, but this generally disappears rapidly. When, however, it has often attacked the textures surrounding the joints, as in gout, the phosphate of lime of the bone is at times absorbed, and tophaceous concretions, containing urate or lithate of soda, are deposited in its place. (See Gout.)

Inflammation may differ materially, according as the causes inducing it are *common* or *specific*. When not otherwise mentioned, the descriptions are considered to apply to the former,—the latter being attended by phenomena that are somewhat peculiar. We have examples of specific inflammation in scrofula, as well as in that produced by morbid poisons;—as in small-pox, measles, glanders, poisoned wounds, &c. &c.

The effect of various conditions of the blood in the production of inflammation has been the subject of much investigation—of late years more especially. It has been long known, that if oleaginous or finely pulverized substances be injected into the blood-vessels, they may circulate freely until they reach the extreme vessels; but in them they become the source of obstruction and consequent inflammation. A viscid matter, innocuous in itself—gum for example—was dissolved by M. Magendie, in a little water; and, after being coloured, the fluid was injected into the jugular vein of an animal. So long as the injection traversed the large venous trunks, no disorder was occa-

sioned, but as soon as it reached the radicles of the pulmonary artery, the circulation was almost instantly arrested; and as the encephalon no longer received the necessary excitement from arterial blood, its functions ceased and the animal quickly perished. The body was immediately examined, and on cutting into the pulmonary parenchyma, in a direction perpendicular to that of the principal vessels, they were invariably found filled with the substance injected. Viscidity of the blood may likewise arise spontaneously from disease, and in all such cases some serious lesion of the lungs is to be apprehended. On the other hand, experiments have shown, that if blood be deprived of its fibrin, and be injected into the vessels, death speedily results; and in such cases the blood has been found to have become so utterly unfit for circulation in the capillary vessels, that it was extravasated into the various tissues, and especially into the parenchyma of the lung. If the fibrin be removed from the blood in small portions, local lesions are induced, of which the origin cannot be mistaken. It would appear, consequently, that whenever the blood becomes much thinner than in health, it ceases to be adapted for the vessels in which it circulates, and transudation takes place through their parietes. In this mode—as the author has repeatedly remarked,—bleeding in many cases of hemorrhage proves detrimental,—especially if watery fluid be freely allowed at the same time. "We were speaking," observes M. Magendie, "of the viscidity requisite for the circulation of the blood through our organs. Now, here is the blood of an individual who had an attack of hæmoptysis, and was bled freely for it. You know well what I think of that remedy—worse perhaps than the disease. Be that as it will, you may perceive, that this blood is very slightly viscous. I, in consequence, presume, that farther mischief will occur. We shall see if my presumptions be realized:"—and he adds—"If you bleed an animal several times and replace the blood withdrawn by water, exhalation and effusion into the cavity of the pleura will follow, and subsequently into the peritoneum. Now you have done no more than diminish the viscidity of the blood by adding a little water to it."

As the condition of the blood is changed during inflammation, so is that of the urine, which is formed from the blood. Its general characteristics, according to M. Simon, are the following. It is darker than usual, and is of a yellow, brown, or reddish-brown tint; has an acid reaction, and is generally of a high specific gravity. With regard to its most important constituents, the urea is either absolutely increased, or it is at the ordinary healthy average, or may be a little below it. The uric acid is always absolutely increased, as well as the extractive matters, especially the alcohol-extract. The salts are always absolutely diminished, especially the chloride of sodium; the sulphates, on the other hand, either approximate the healthy average or are not far below it. The composition of the urine becomes changed if much blood be abstracted during the progress of the inflammation. It becomes clearer, specifically lighter, and the amount of urea decreases absolutely and relatively.

On the *Terminations*, as they are called, of inflammation, it will not be necessary to dwell. The morbid condition may pass away without

leaving any alteration of structure in the part affected, or it may end by *resolution*. It may terminate suddenly, or by *délitescence*, as the French term it; or, it may leave one part and pass to another, by what is termed *metastasis*, or *shifting of seat*.

One of the earliest and most constant of its effects is an effusion of the serous or watery part of the blood, which—as before remarked—is one of the cases of the tumefaction of an inflamed part. The appearance of this effusion, when it occurs at a later period, varies greatly;—at times, being limpid and colourless; at others, variously tinged, in consequence of admixture with the red particles of the blood, or with coagulable lymph or pus. In extensive inflammations of serous membranes, the quantity of fluid, mixed with flakes of coagulable lymph, is sometimes very great.

The effusion of coagulable lymph itself or of the *liquor sanguinis* is an early result of the inflammatory process where parts are divided, and especially of the inflammation of serous surfaces. The exudation is possessed of plastic properties; gradually becomes organized, and is the medium of those adhesions, between the pleura costalis and pleura pulmonalis, for example, which are so often found on dissection, even when the patient has died of some other disease, and *à fortiori*, where death has been owing to pleuritis. When first poured out, the exudation is fluid, but it soon coagulates, the serum being absorbed. When examined by the microscope at the commencement of its becoming organized, a number of exudation-corpuscles, formed as the fibrin coagulates, is seen in it, which have the appearance of regular cells arranged in layers, and adhering together by an intermediate unorganized substance. Some hours later, a fibrous character presents itself, which is considered to be owing to the adhesion of the cells together in lines. Between the cellular fibres a considerable amount of cytoblastema yet remains, and they may be readily separated or torn in any direction. A vascular network next appears, which forms a connexion with the vessels of the subjacent surface. According to M. Andral, two matters—the one globular, the other reticular—characterize, in the solid, the morbid process, which we term inflammation. The reticular matter is nothing more than fibrin, perfectly similar to that which exists in the blood; the globular matter, he thinks it probable, is also fibrin, but altered in its nature, and arrested in its coagulation. These two matters have very different destinations. The one, the reticular, is susceptible of passing into the organized state; vessels may be seen ramifying in it, and it may become a tissue. It is this which forms adhesions, and under the name of "coagulable lymph" is interposed between the lips of wounds, and becomes the medium of their reunion. In place of being injurious by its presence, it is, consequently, an instrument of reparation for the tissues, and ultimately becomes completely identified with them. The other, on the contrary, whether it have a common origin or not with the reticular, can never remain in the textures without disturbing more or less the whole economy. It is incapable of organization, exhibits no trace of vitality, and is rejected by the organism. If not eliminated, disease

results, and the elimination itself is frequently not accomplished without the supervention of unpleasant symptoms.

It is not common for the mucous membranes, when inflamed, to throw out fibrinous matter copiously; but the various diphtheritic affections afford examples of it. When such effusion does occur to any amount, the affection is always one of grave import, and is generally dependent upon a peculiar state of the system as well as of the part affected, which predisposes it to this form of inflammation, rather than to the ordinary erythematic variety.

Another termination is by *suppuration* or the formation of pus. Much discussion has taken place as to whether the pus is formed within or without the vessels, or in both situations. The common belief is the last; and the process is conceived to consist in the conversion of the corpuscles of the blood and lymph, from which the colouring matter has been separated, into an opaque fluid nearly of the colour and consistence of cream. M. Magendie considers the essential difference between the terminations by resolution and suppuration to consist in the fact, that in the former the molecules of blood re-enter the circulation after having been softened; whilst, in the latter, they undergo further modification and are expelled from the system. In the opinion of M. Gerber, which has been embraced by most observers, those exudation-corpuscles that lie beyond the vivifying influence of the suppurating surface, and are exposed to external agencies cannot be expected to retain their vitality for any length of time: they begin to degenerate in their organization, and to suffer changes in their chemical constitution, whilst those that continue in immediate contact with the living structures advance in their organization. The corpuscles that are cast loose then die. In ill-conditioned sores, the surface of which is not giving origin to new structure, the discharge is not found to contain the true pus-corpuscle; but in place of it are found what are called ichor-corpuscles, which have been considered to be evidently altered blood-corpuscles.

That pus may be formed from blood, apparently without any action on the part of the capillary vessels, is shown by the fact, that distinctly purulent matter, according to M. Andral, has been found within coagula in the large vessels and in the heart, where there has been no suppurating surface,—the result, it has been supposed, by M. Piorry, of hæmitis or inflammation of the blood:—and, that the vessels are, in other cases, implicated, is equally demonstrated by the circumstance, that when inflammation has continued for some time in any important organ, corpuscles of pus are said by Mr. Gulliver to have been recognised in the blood. This, however, has been combated by M. Mandl, who maintains, that the white corpuscles, considered to be pus-corpuscles, originate in the fibrin as it coagulates on the object-glass of the microscope. They do not exist—he affirms—whilst the blood is circulating, and form either on the object-glass, or in the vessels after death. M. Mandl maintains—and M. Donné appears to accord with him—that microscopic examination cannot determine, whether the blood be pure or mixed with pus, as the purest blood contains corpuscles in every respect like those of pus. The size of the pus-

corpuscles varies between the $\frac{1}{80}$th, $\frac{1}{100}$th, and $\frac{1}{110}$th, of a millimètre, a circumstance which he considers to decide the question of purulent absorption, since corpuscles of this size could not pass through the parietes of the vessels.

When pus is effused from large membranous surfaces, as from the pleura, the membranes are often found thickened instead of extenuated; and this has been adduced as a reason for the belief, that pus is not formed at the expense of the tissues. The phenomena of *ulceration*, on the other hand, seem to show, that there may be solution of the solids; but the loss of parts is probably owing, mainly, to absorption. Why this absorption takes place under such circumstances, it is not easy to say. The remark of Dr. Alison, that "the commencement of ulceration, as an effect of inflammation, implies merely, that the attraction by which extra-vascular matters are constantly taken into the small veins, preponderates over that by which portions of the blood pass out of the capillaries," is a mere expression of what is conceived to be a fact. It throws no light on the subject.

It would appear, that the corpuscles of various species of pus may be recognised by certain physical characters, which vary, however, according to the organs or tissues in which it is formed. It is thin and grayish in the bones; opaque and caseiform in the cellular membrane; flocculent in the serous, and greenish and thready in the mucous membranes; reddish in the liver, and yellowish-gray in the muscles. M. Magendie asserts, that one of the gentlemen present at his lecture, M. Kluge, was able to distinguish the different species of pus from each other, by simple inspection of the corpuscles. He was subjected to a variety of tests, and in every instance was successful. M. Magendie took pus from the hospital, which had been collected in the lung, the pleura, the peritoneum, and the cellular tissue, and M. Kluge invariably announced its source with perfect accuracy. On one occasion, Magendie endeavoured to entrap him by presenting him with some artificial pus of his own making, as if it had been taken from one of his patients, but M. Kluge was not to be deceived. "This important fact,"—adds Magendie,—"is another to be added to the list of experimental discoveries."

Normal pus—*pus bonum et laudabile*—consists essentially of two distinct parts,—the pus-corpuscles referred to above, and a colourless aqueous fluid—*liquor puris*—in which the pus-corpuscles are suspended as in an emulsion. Its specific gravity, according to M. Vogel—to whose work and to that of M. Simon, the reader may refer with much advantage—is 1·030—1·033.

In cases of extensive injuries, attended with loss of parts, it has been generally supposed, that the processes of granulation and suppuration, which are attended with much local inflammation and constitutional disturbance when the surface is large, are the only means by which the wound can be filled up. Occasional instances have, however, occurred, in which large wounds have closed under the clot of blood by which they were at first covered, without any suppuration or other symptom of inflammation, and in these cases it has been found, that the new surface much more nearly resembles the ordinary one than

the cicatrix does which follows granulation. Dr. Macartney, of Dublin, called this the *modelling process*, and he regarded it to be precisely analogous to that which is concerned in the ordinary process of growth, and in the reproduction of whole parts which takes place in the lower animals without inflammation; and after a comparative survey of the operations of reparation and inflammation, as accomplished in the different classes of animals, he was led to the conclusion, that the powers of reparation and reproduction are in proportion to the indisposition or incapacity for inflammation; that inflammation is so far from being necessary to the reparation of parts, that in proportion as it exists, the latter is impeded, retarded, or prevented; that when inflammation does not exist, the reparative power is equal to the original tendency to produce and maintain organic form and structure, —and that it then becomes a natural function like the growth of the individual or the reproduction of the species.

Other terminations of inflammation are—*induration*, and the opposite condition—*ramollissement*, *mollescence* or *softening*. It is not known how these changes in the nutrition of the part are induced. Where coagulable lymph is thrown out and becomes organized, it may be understood, that the parts may acquire a firmer texture; but it is not easy to comprehend the modified nutrition sometimes induced, as where orchitis or inflammation of the testicle is converted into scirrhus; and the modified nutrition that occurs in ramollisement is equally inexplicable.

The most unfavourable of all the results of inflammation is *gangrene*. It is probably owing, mainly, to the stagnation of the blood in the capillaries of the part; for when substances have been injected into the capillaries, so as to choke them and arrest the circulation, gangrene has taken place rapidly in the limb. There is reason, however, for the belief, that this is not the sole cause, but that the death of the blood, and of the textures surrounding the blood in inflamed parts, is an effect, at least in part, of the previous changes in them during the state of inflammation.

Such are the general terminations of inflammation; at times supervening rapidly, as in the *acute* forms; less speedily and decidedly in the subacute; and still less so in the chronic. Between the acute and subacute forms of inflammation, the difference consists in the relative intensity of the inflammation. The chronic form often succeeds to the two others; but although the word *chronic* implies, that time ought to enter as an element into the definition, the diseased conditions may be, from the very first, such as characterize the chronic form when it succeeds to the acute. All these forms may, however, and often do, run into each other, so that, in practice, they are not easily distinguishable.

From the whole consideration of the subject, we are justified, then, in adopting the following views of an able writer, Dr. Alison. "In order to give the requisite precision to the general notion of inflammation, as a local change of the condition of any part of the body, it seems only necessary to include in it, besides the pain, swelling, heat, and redness, the tendency always observed, even when the changes in question are of short duration, to *effusion* from the blood-vessels of some

new products, speedily assuming, in most instances, the form either of coagulable lymph or of pus. It is true, that there may be inflammation either of so slight intensity, or so short duration, as never to show these, its usual consequences; but we shall escape a great deal of useless verbal discussion and misapprehension, if we lay it down as a rule, never to apply the term except in cases where we are satisfied, that the tendency to these effusions exists, and that if they do not appear, it is only because of the minute scale, or the rapid abatement of the diseased action. A peculiar *perversion of nutrition* or of *secretion*, we hold to be essential to the very existence of inflammation; and all descriptions, and all attempts at explanation of the changes to which the term is applied, if they do not include this, their most essential peculiarity, we must regard as necessarily and fundamentally defective. It is true, that the various effects, which we ascribe to inflammation, adhesion, suppuration, ulceration, gangrene, are very different from one another, and that we cannot satisfactorily point out the cause, or even the mode, by which each is effected; but we may be fully assured, from ample observation, that all these occur as effects of an inflammatory action, originally of the same kind; we can go a certain length in pointing out the conditions under which each of these results takes place, and we may refer to them as general and established facts, in any pathological discussions on more obscure phenomena."

Causes.—Any condition of the system, or of any part of it, which gives occasion to irregularity of circulation in the capillary vessels, may be the cause of inflammation. Amongst the circumstances which predispose to it, must be reckoned polyæmia, as well as the opposite condition—anæmia; the irregularity of circulation induced by general diseases,—as fevers of all kinds, and constitutional predispositions, as gout, rheumatism, scrophula, &c. In the evolutions, too, that take place at different ages, predisposition to inflammatory and other affections, in certain parts of the economy, is developed. In childhood, for example, the predisposition is to the mucous lining of the bowels, and to the encephalon; after the age of puberty, the tendency is to the lungs; and in old age, it is rather to the lining membrane of the urinary apparatus. Climate, likewise, affords a predisposition. In hot regions, as in India, we find a predisposition to disease of the lining membrane of the bowels and of the liver; whilst in temperate regions, the tendency is rather to the mucous membrane of the air-passages. The same may be said of seasons:—winter predisposes rather to inflammation of the air-passages; summer to that of the mucous lining of the bowels. Perhaps at all times, in every individual, there is a predisposition in some part of the economy, rather than in another, to assume irregular action under the influence of adequate exciting causes. When, for example, a dozen persons are subjected to the same exciting cause,—exposure of the feet to cold and moisture,—all may not be affected in the same manner. Some may escape disease altogether: of the rest, one may be attacked with bronchitis, and another with inflammation of the tonsils, according to the greater predisposition in one of those parts, at the time, to assume inflammatory action. It can rarely happen, that there is so much harmony of func-

tion, that all parts of the organism are in a perfectly healthy condition. A difference likewise exists in individuals, as to the degree of this predisposition:—thus, some are liable to catarrh and sore throat, on exposure to the slightest deranging influences.

As regards the exciting causes,—those termed *common*, when they concern the surface of the body, are easily appreciated. If we apply certain irritants to the skin, inflammation is developed under the eyes of the observer. Occasionally, too, inflammation of the alimentary tube, and of the air-passages, is induced by powerful irritants received into those channels; but, more commonly, internal inflammation is developed spontaneously,—or, in other words, we are unable to discover the immediate cause. Generally, perhaps, it is owing to partial and irregular exposure of some part of the body to cold and moisture; yet it is rare, that this morbific impression is made directly on the membrane of the air-passages, either by cold alone, or by cold combined with moisture. In the arctic regions, no inconvenience has been experienced from receiving into the lungs air at a temperature of from 55° to 70° below the zero of Fahrenheit's scale. The character of the atmosphere, as to heat and dryness, varies so much, that the air-passages are accustomed to resist its action; but if a part, habitually dry and covered, be exposed to cold and moisture; or if cold air be suffered to impinge for a time on a small surface, few persons escape disorder of some kind. These partial exposures are proverbially noxious.

In addition to the common causes of inflammation, there are others —as already remarked—of a *specific* character, as the contagion of small-pox, and other morbid poisons.

Treatment.—On the treatment of inflammation in general, it will be the less necessary to expatiate, in consequence of the full therapeutical details given under the inflammations of different organs. It is scarcely necessary to say, that in this morbid condition, as in all others, regard must be had to the state of the patient; the character of the inflammation, whether produced by common or specific causes; the tissue in which it is seated; its character, whether acute or chronic, &c. &c.

Although active inflammation demands the vigorous employment of the most potent antiphlogistics, there are other forms,—for example, the erysipelatous, in unhealthy individuals, and chronic inflammation in many of its stages,—which may demand a different course. The rule, laid down by those who prescribe for names, rather than for pathological conditions,—that wherever inflammation exists, antiphlogistics are demanded,—is injurious and unfortunate, and has often led to erroneous practice.

A great difficulty with the therapeutist, in many cases of external inflammation, consists in his not being able to determine in all cases, —whether the atonic condition of the extreme vessels induced by over-distension, or the excited state of the vessels communicating with them, be the condition which more especially requires attention; —hence, the difficulty of deciding in certain cases, whether astringents or slight stimulants, or the opposite plan of treatment—the anti-

gistic or soothing—ought to be adopted. This difficulty often im-
ses the practitioner; and, not unfrequently, he finds himself compelled to resort empirically to one set of applications, and if they do not succeed, to have recourse to the other. In some varieties of burn, which is an inflammation of the skin, excitant applications are found of service; in others, powerful antiphlogistics. In cases of ophthalmia, in which the extreme vessels have remained dilated for a length of time, essential benefit has been derived from dropping strong stimulants upon the inflamed surface, and even from radiant caloric applied to the eye as hot as it could well be borne.

The essential indications in inflammation are generally; *First*, to reduce the amount of stimulus or of blood circulating in the vessels, and the activity of the heart and arteries. *Secondly*, to diminish the excitement more directly in the inflamed part, and to modify the morbid condition of the extreme vessels. The chief agents, employed with the first view in active inflammation, are sedatives,—as bloodletting; tartrate of antimony and potassa, given, either in contra-stimulant doses, as a revellent, or to excite and keep up nausea, as a sedative; and digitalis, colchicum, and the hydrocyanic acid, given as sedatives. Of the sedative agents, bloodletting is the most important. It reduces directly the amount of stimulus in the vessels, and diminishes the local excitement. Elsewhere (*General Therapeutics and Mat. Med.* 3d edition, ii. 150, Philad. 1846), the author has entered into a consideration of the rules that ought to guide the practitioner in the use of this important agent; and has especially dwelt on the importance of not pushing it so far as to induce symptoms, that may be fairly referable to loss of blood, rather than to the morbid actions, for the removal of which it was practised. Even when bloodletting is clearly indicated, it is always, perhaps, improper to push it to the extent of inducing temporary collapse, as in syncope; for in all cases reaction succeeds, and the full amount of benefit is not derived as in cases where the lancet is used to such an extent as to diminish the amount of the circulating fluid without endangering violent reaction.

Researches into the constitution of the blood in various diseases have led M. Andral to infer, that when once the blood has commenced producing an excess of fibrin, a certain time is required before this disposition is exhausted, or in other words, the process is self-limited. Still he thinks at the earliest period, when the solid is merely congested, and the fibrin of the blood is scarcely above its healthy proportion, the advance of the disease may be arrested by bloodletting, and in certain cases it may be cut short. Moreover, although bloodletting does not appear to diminish the proportion of fibrin, it renders the blood less dense, and more liquid, and may, consequently, aid the circulation through the capillaries generally, and thus diminish the retardation or stasis in the inflamed part.

The arrest of the blood in the veins of the extremities—*hæmostasis*—has been urged by Professor Nathan R. Smith, and by Dr. Thomas H. Buckler, of Baltimore, as a sedative agent to relieve inflammatory engorgement in parenchymatous organs, or inflammations of membranous tissues,—to remove hyperæmia and to restore the balance of the

circulation, as well as to prevent hemorrhage resulting from either rhexis, diapedesis, or from wounds inflicted upon blood-vessels. If a bandage be applied around a limb sufficiently tight to arrest completely the venous circulation, and at the same time allow the arteries to pulsate, the blood within the distended veins is cut off as it were from the general circulation; a depletory effect is in this manner induced, and if the arrest of the venous circulation be practised on all the extremities at once, the skin becomes relaxed; the force of the action of the heart and arteries is weakened; and if the ligatures be applied when the heart and arteries have been deprived of a portion of the ordinary amount of blood, owing either to anæmia or to bleeding, so that the vessels are partially empty, it is found, according to Dr. Buckler, that the exhalents of the skin pour out the most copious perspiration,—that the patient complains of a light feeling about the head, of weakness and sickness of stomach; and if the carotids be pressed upon, they are discovered to be scarcely pulsating, and all the phenomena of syncope may take place.

Possessed of such powers, hæmostasis may, doubtless, be found a valuable agency in the phlegmasiæ more especially, and it has been urged upon the notice of the profession by Dr. Buckler. "Hæmostasis," he strongly remarks, "accomplishes what no other known remedy is capable of doing. It puts syncope under our control, both as to duration and degree. It is capable of exerting, under given conditions, a more powerful control over the circulation than the lancet, antimony, or digitalis, and controls the heart's action without exhausting the vital forces, or giving rise to the ill consequences, which the protracted use of most of the sedative agents is likely to do. And finally, hæmostasis in the hands of judicious practitioners, must prove the means of saving an incalculable amount of blood; to say nothing of the incredible benefits, which would be derived from its adoption by those Sangrados of our art, who bleed empirically in all conditions, and who, in many cases, like the fabled vampire, suck the living current until the vital powers are spent."

Dr. Buckler's view of the general *modus operandi* of hæmostasis effected by the tourniquet or bandage is the same as that of Dr. Mackintosh, and is, in the author's opinion, the true one. It meets with favour, too, from Dr. Dickson, of Charleston, now, of New York. Dr. Kellie, however, who proposed the plan in the cold stage of intermittents, and who declares it to be uniformly successful in bringing on promptly a mild hot stage, supposes it to act by obstructing the downward flow of blood, which, being thus thrown back upon the heart, excites it to more vehement and ready reaction.

Hæmospasy to which the author has referred elsewhere, (*General Therapeutics and Materia Medica*, 3d edit., ii. 258, Philad., 1846, and *New Remedies*, 5th edit., p. 617, Philad., 1846,) which consists in removing the atmospheric pressure from a large extent of surface, as from one or both extremities, acts like hæmostasis. The face is rendered pale, the pulse slower, with, at times, tendency to syncope, and often a good deal of disturbance of the gastric and intestinal functions. It may be employed under the same circumstances as hæmostasis, and

likewise in affections of internal organs that require the use of an efficacious and powerfully revellent influence.

It is, of course, only in the active stage of inflammation, that copious bloodletting can be required, or be proper. In the chronic form, topical bloodletting may be more beneficial,—at times, by relieving the system of a portion of blood; but less in this way, than by diverting the current towards the part whence the blood flows; and acting revulsively in another manner, by the irritation from the leech-bites or the wounds made by the cupping instruments.

Next to sedatives, revellents are the most powerful remedies in inflammation. Where the disease is not seated in parts that can be irritated during their operation, emetics and cathartics often act most beneficially by concentrating the vital manifestations towards the stomach and intestines. Blisters, too, as well as pustulation by the tartrate of antimony and potassa, croton oil, &c., are excellent derivatives when the force of inflammatory action has been somewhat subdued by the appropriate employment of sedatives. In the violence of inflammation, when the blood is already surcharged with fibrin, the inflammation, that results from any cutaneous irritant, extensively applied, may still further augment the proportion of the fibrinous element, and thus be productive of disadvantage.

With the view of its revellent action, mercury is extensively employed in many phlegmasiæ, but less so in others; and the same may be said of opium, which, in large doses, is a precious sedative. There are many cases, too, in which it proves most salutary by deadening the sensibility of the nervous system, and thus preventing those reflected irradiations, which react upon the inflammation, and doubtless often augment it. It has been recommended, too, with the view of diminishing the amount of the fibrinous element of the blood; but the observations of M. Andral do not sanction the idea of its being possessed of any such virtue.

The alkalies and neutral salts have, likewise, been regarded as exerting a positive effect upon the blood. Many of them certainly possess, out of the body, the power of dissolving fibrin, but it may well admit of question, whether they are capable of any such action on the circulating fluid. The bicarbonate of soda, nitrate of potassa, and muriate of ammonia, have the reputation more than any other salts. M. Lebert affirms, that M. Prévost of Geneva communicated to him some highly interesting observations on the salutary effects of the bicarbonate of soda in different phlegmasiæ, and especially in two cases of intense bronchitis.

In regard to topical remedies to the inflamed part, where it can be reached, soothing and excitant applications are employed, according to circumstances not always appreciable or easily designated. As before remarked, where the atonic condition of the extreme vessel predominates, and especially if there be not much increased action, hot and excitant applications may be needed; — on the contrary, where the increased action of vessels is considerable, cold and sedative applications will be more beneficial. In many cases, experiment alone can indicate which ought to be preferred. The subacute

form of inflammation require a treatment based on the same general principles as the more active; whilst in the chronic, more is to be done by revellents than by depletives or sedatives; and, not unfrequently, as in certain forms of unhealthy inflammation, excitants, carefully exhibited, may be required throughout.

In every form of active inflammation, mental and corporeal quiet should be enjoined, and the diet should be spare and unirritating. The same may be said of the diet in the subacute and chronic forms; but where excitant remedies are considered advisable, it may be of a more nourishing character. The chronic forms, which have resisted every variety of treatment, occasionally yield at length to the thorough revulsion effected by change of air, society, and scenery. The special adaptation, however, of particular agencies to the inflammations—common and specific—of particular organs, can only be considered under those heads.

BOOK IV.

DISEASES OF THE ORGANS OF SECRETION.

The different glands of the body are of complex organization; yet, when unravelled, their composition is not, perhaps, so intricate as it would, at first sight, appear. Every gland has a vessel, which conveys arterial blood for its nutrition, and from this arterial blood the secretion is in all cases formed,—the chief supposed exception being in the case of the liver, which receives both arterial and venous blood. A vein communicates directly or indirectly with the artery, whose function is to convey back towards the heart the venous blood, which has become such, owing, in part, to the arterial blood having experienced modifications in fulfilling the offices above mentioned;—and, likewise, a radical or radicles of an excretory duct, which receive the secreted fluid, and convey it to some outlet. Lymphatics also exist, as well as nerves; and these are all bound up together by cellular membrane, so as to form minute granular masses, which, again, are associated by cellular membrane, so as to constitute, in some organs, distinct lobules. These granular masses are closely connected by means of cellular membrane, and finally a cellular sheath covers the whole organ, and preserves its various anatomical constituents *in situ*. The exact mode in which the vessel, from whose blood the secretion is effected, communicates with the excretory duct, does not admit of ready detection. An interesting pathological case, which fell under the author's observation, (*Human Physiology*, 6th edit. ii. 289, Philad. 1846, and article Cancer of the Liver, in the present work,) confirms this view, that the glandular structure consists essentially of a duct with a blind extremity, on whose parietes plexuses of blood-vessels ramify, from which the secretions are immediately produced.

Of the mode in which secretion in general is accomplished, we know nothing. It occurs—like nutrition—in the very tissue of the organs. Our knowledge appears to be limited to the fact, that in particular organs, various humours are separated or combined from the blood, some of which can be detected in that fluid, others not. In the upper classes of animals, it would seem, that the function requires, for its perfect execution, the presidency of a nervous system; yet if we take an enlarged view of organized bodies, the presence of nerves would not seem to be indispensable. In the very lowest classes of animals,

nothing like a nervous system has been discovered; and we have the most indisputable testimony of the existence of secretion in the vegetable, in which, if there be a nervous system, it is certainly only rudimental; yet the function is accomplished as perfectly, and perhaps in as multiple a manner as in man. In the upper classes of animals, however, we have many examples of modification of the function, through the agency of the nervous system:—the sight of luscious food will excite the secretion of saliva, and there can be no doubt, that the sight of the offspring occasions an increased secretion from the mammary glands of animals.

The first effect of inflammation of any glandular organ is to arrest its secretion; if the inflammation, however, continues, the secretion is restored, but it does not possess the healthy character. It is more or less modified, and may act upon the excretory ducts, or the parts over which it passes, very differently from the healthy fluid. For example, although bile, when it passes along the intestines, may not irritate the lining membrane when the secretion possesses its usual properties, it may be the source of much irritation, when its properties have become changed by inflammation, or any other pathological condition of the organ that secretes it. But although inflammation may arrest the secretion from glandular organs, irritation—short of inflammation—may augment it. Thus, the presence of food in the duodenum excites the lining membrane of that intestine, and the excitation is propagated along the ducts to the liver, which increases its secretion; and the same effect is more distinctly induced by cathartics, that act more especially upon the upper part of the intestinal tract. A yet more striking example of the secretory irritation, induced by particular agents, is that of mercury, whose action upon the salivary glands is one of the most notorious of its properties.

CHAPTER I.

DISEASES OF THE SALIVARY GLANDS.

The glands, which secrete the saliva, are the *parotid*, the *submaxillary*, and the *sublingual;*—the parotid, situate in front of the ear and behind the neck and ramus of the jaw,—the submaxillary, beneath the body of the bone; and the sublingual, immediately beneath the tongue;—the parotid and submaxillary having each but one excretory duct,—the sublingual several. The secretion from these various ducts is poured into the mouth, where it becomes mixed with the exhalation and mucus from the mucous membrane. It usually contains free alkali, but in rare cases, during meals, it has been found acid, and during fasting, it is occasionally neutral. It has, indeed, been affirmed to be acid whilst fasting, and to become alkaline during eating, the alkaline character disappearing, at times, with the first mouthful of food. In different morbid conditions it is more or less affected, but its varying character has not been sufficiently investigated. Morbid saliva at times contains a free acid, which is most commonly the lactic; but occasionally the acetic is likewise present. M. Simon has frequently seen the saliva acid in acute rheumatism and in cases of salivation. According to M. Donné, it has an acid reaction in all cases of irritation and inflammation of the stomach, in pleuritis, encephalitis, intermittent fever, acute rheumatism, uterine affections, and amenorrhœa. Brugnatelli detected oxalic acid in the saliva of a phthisical patient.

I. INFLAMMATION OF THE PAROTID.

Synon. Inflammatio parotidis, Parotitis, P. erysipelatosa, P. polymorphia, P. epidemica, Parotiditis, Erythrochærus, Empresma parotitis, Angina parotidæa, Cynanche parotidæa, C. externa, Angina externa, Mumps, Branks; *Fr.* Parotide, Inflammation de la Parotide, Oreillons, Ourles; *Ger.* Entzündung der Ohrspeicheldrüse, Ohrspeicheldrüsenentzündung, Ohrdrüsenentzündung, Bauernwetzel, Ziegenpeter, Tölpel.

Many pathological writers have separated the inflammation of the parotid to be described in this place, and which generally occurs epidemically, from simple parotitis, and the inflammatory enlargement of the gland, which is symptomatic of other affections; as of plague. The former—*Oreillons*, *Ourles*, or *Mumps*—is regarded by M. Grisolle to be seated in the cellular tissue of the parotid region, whilst the latter—*Parotides*—affects the glandular granules themselves. This distinction, cannot, however, be considered as established. It is, indeed, by no means proved that in all cases both are not implicated. The inflammation of the parotid gland, termed *Mumps*, is singular in regard to some points connected with its pathology, and, especially, in affording examples of strange sympathies, which exist in the morbid condition of the gland, but are not perceptible in the physiological or normal state.

Diagnosis.—The disease is ushered in by the ordinary general phenomena of internal inflammation; after which, or simultaneously, a

sense of pain or uneasiness is experienced in the region of the parotid, with difficulty in mastication, which becomes, at times, almost impracticable. Sooner or later, beneath one or both ears, more or less tumefaction is observable, which is commonly red and hot, and extremely painful on pressure. Occasionally, the pain is so severe as to deprive the individual of rest. When the inflammation is considerable, the swelling extends to the submaxillary glands, and to the tonsils and the neighbouring parts of the pharynx, so that deglutition becomes very difficult and painful. The tumour, in such case, is generally of a deep red, tense, and glossy; and if both sides be affected at the same time, the face becomes of an enormous size. The swelling rarely goes on augmenting more than four or five days; after which it gradually subsides, when the termination is about to be by resolution. Cases occasionally occur, in which the swelling is rather œdematous than highly inflammatory, and in which it presents neither redness, very marked resistance, acute pain, nor difficulty in moving the jaws. The general symptoms, may, in such cases, be slight also.

Most commonly, the disease terminates by resolution. About the fourth or fifth day, the swelling, pain, and fever gradually subside, and the inconvenience disappears. It has been asserted by M. Andral, that about the fourth or fifth day, a copious perspiration bathes the parotid region and the parts of the neck, ears, and head in its vicinity; and that, in other cases, a general perspiration precedes the gradual softening and disappearance of the tumour;—but there is nothing constant in the order of the phenomena. Those, mentioned by M. Andral, are often seen in cases where the cutaneous transpiration has been arrested for a time, in consequence of febrile or inflammatory indisposition. In some cases—but they are rare—inflammation of the parotid ends in suppuration; the tumour points, and fluctuation is manifest. The author has met with but one case of this kind. The termination in gangrene is still more uncommon.

A very frequent occurrence, and one which is the most interesting point in the pathology of the disease, is the metastasis or translation of the irritation from the parotid to the testicle of the same side in the male; and to the mamma in the female. In the female, the sexual organs are also said to swell occasionally under the same circumstances, but the author has never met with such a case. Usually, the tumour of the parotid suddenly subsides, and all the signs of inflammatory irritation diminish, or cease; and almost immediately afterwards pain and inflammation are experienced in the parts mentioned. The orchitis in the male, and the mastitis in the female, under appropriate management, generally terminate by resolution; but, at times, the affected testicle is entirely absorbed. Occasionally, the inflammation in this *changeable phlegmasia*—as it has been termed—leaves the testicle or mamma as suddenly as it invaded the organ, and a fresh attack of parotitis supervenes.

Causes.—Age certainly offers a predisposition; for the disease is most common in children, and the proportion of males attacked is greater than of females. After the period of puberty it is less fre-

quently seen. One attack appears to produce an effect upon the constitution, which renders the individual less liable to it again; for second attacks are not common. The disease unquestionably appears epidemically, or rather endemically;—that is, we see it in a particular locality prevailing more than in others, and perhaps exclusively; showing, that there are local causes which give rise to it, probably under favourable atmospheric influences;—or the disease must be esteemed endemico-epidemic in its character. Inflammation of the parotid often, too, occurs as sympathetic of other diseases,—as in the course of severe fevers; but to this variety reference is made elsewhere. In some of the visitations of cholera it was noticed, especially towards the end of the epidemic. This was the case in Paris, according to MM. Rayer and Duplay, and in Rostock, according to M. Most. Generally, the disease is looked upon as contagious, but the author's observation does not enable him to speak positively on this point. It is, indeed, extremely difficult to decide the question, in consequence of the persons attacked being generally in the same locality, and more or less exposed to the same influences.

Treatment.—This must be altogether antiphlogistic; but the disease does not usually demand much activity. If the tumour be extremely large, hot, and painful, local depletion, by means of leeches, may be employed, and repeated as it may be necessary; and after each application, emollient poultices may be placed over the leech-bites. At the same time, saline cathartics may be administered, so as to act gently on the bowels; and the patient be put upon diet, which is appropriate to other inflammatory affections,—strict quiet being, at the same time, enjoined. This treatment is generally sufficiently active for the more severe cases. In those that are less so, cataplasms, rest, abstinence, and covering the part with flannel, are sufficient. Both in its stage of inflammation and of suppuration, this phlegmasia has to be managed according to general principles:—it must be borne in mind, however, that the affection usually runs a definite course, or appears to be self-limited; and that any unfavourable termination is extremely rare; so that great energy of treatment cannot be demanded.

When the inflammation has attacked other organs metastatically, the rule of treatment should be, to combat these secondary affections as if they were primary, having no regard to the original inflammation of the parotid. Usually, the indication is presumed to be, to call back the irritation to the part primarily affected, by the application of revellents—as of sinapisms or blisters—to the region of the parotid. The remedy, however, as the author has elsewhere said, (*General Therapeutics and Mat. Med.* ii. 229, Philada. 1846,) is not as clearly indicated as might at first appear. The organs concerned seem to possess a reciprocal sympathy under particular morbid conditions only, between which, and the irritation excited by revulsives, there may not be the least similitude; and this accounts for the want of success experienced, whenever an attempt is made to recall a "changeable phlegmasia" to its former seat. The author—in accordance with the views generally entertained on this matter—has repeatedly at-

tempted to bring back the inflammation to the parotid, yet he does not recollect any instance in which the appeal was responded to; and hence he attends to the superinduced inflammation, as if it were primary. It is, indeed, by no means clear, that the artificial irritation, which we excite over the region of the parotid, in such case, can be practised with entire impunity. The inflammation, which we are desirous to call back—it must be recollected—was originally seated in the region which we are about to irritate artificially; and a question might properly arise, whether the artificial irritation, which we induce, may not equally pass to the organ secondarily implicated, and add to the mischief already existing; so that revellents, applied to the parotid region, might in reality be less safe and efficacious than if they were applied to any other part of the economy.

Occasionally, symptoms of encephalitis and of gastric inflammation occur in the course of parotitis. They must be met upon the same principles.

II. PTYALISM.

Synon. Ptyalismus, Sialismus, Sielismus, Sialachus, Sialozemia, Salivatio, Epiphora ptyalismus, Sialorrhœa, Salivation; *Ger.* Speichelfluss.

An increased secretion of saliva may arise from various causes, and is frequently altogether symptomatic,—as in children, during dentition. When it occurs as a symptom, it will be described under the primary affection.

Ptyalism may be considered under two heads—the *first* embracing that which arises spontaneously, often without any obvious cause; and the *second*, that which is produced by mercury.

a. *Spontaneous Ptyalism.*

Synon. Ptyalismus idiopathicus, P. spontaneus, Sialozemia simplex, Idiopathic Ptyalism or Salivation.

Salivation occasionally occurs, especially in children, with all the characters of mercurial salivation, when not a particle of mercury has been administered. It is essential to bear this fact in mind, inasmuch as blame is frequently attached to the medical practitioner, where such symptoms arise, under the idea that he has been administering mercurials to an objectionable extent. Salivation may be induced by various articles,—as by iodine, the preparations of gold, copper, antimony, arsenic; and it is said, by Dr. Watson, that it has followed the employment of castor oil, digitalis, and opium. Cases are on record, in which it has occurred to a profuse extent, without any obvious cause. Thus, one is related in which two or three pints of saliva were discharged daily, for some time. The affection ceased under the use of gentle cathartics. Many similar examples are on record.

Treatment.—Should such a case present itself, it will be important to examine, whether there be inflammation, or irritation, from carious teeth, or other cause, in the mouth. Should no adequate cause be discoverable, the disease must be referred to some constitutional or local

affection of the glands, which gives rise to secretory irritation, and consequent hypercrinia.

Certain of the remedies, recommended under the next form of ptyalism, may be found serviceable.

b. *Mercurial Ptyalism.*

Synon. Ptyalismus hydrargyratus, P. mercurialis, Salivatio mercurialis, Sialozemia mercurialis; *Fr.* Ptyalisme mercuriel, Salivation mercurielle, Stomalite mercurielle; *Ger.* Speichelfluss durch Mercur.

Diagnosis.—The symptoms of mercurial salivation are well known; but, fortunately, not so much so as formerly, in consequence of the comparative unfrequency of the affection, owing to our improved knowledge of the therapeutical effects, and *modus operandi* of mercury. Prior to the supervention of full ptyalism, phenomena present themselves, which indicate that the mouth is *touched* by the remedy. A disagreeable coppery taste is experienced, accompanied by a painful feeling or soreness in the mucous membrane of the mouth, and in the teeth, which appear to be loosened in their sockets; to these phenomena succeed swelling of the gums, inner surface of the cheeks, tongue, and soft palate, which become hot and painful, and, where the cheek and tongue are pressed upon by the teeth, they are found indented. The gums now fall away from the teeth, and at the edges a whitish secretion is poured out, which has an albuminous appearance. This secretion seems, indeed, to invest the mucous membrane of the mouth, which, consequently, does not appear to be as red as the symptoms would indicate. The parts that are the most swollen and subjected to pressure, soon begin to ulcerate, and the ulcers spread, and present a grayish, flabby, and fungous appearance, blood readily flowing from them. The lymphatic ganglions, situate between the parts affected, and the centre of the lymphatic system, now become swollen and painful; and, at times, the patient is unable to separate his jaws, and almost to swallow, owing to the excessive tumefaction of the parts. From the very commencement, the breath has a peculiar fœtor, and this augments, so that at the height of the disease it is strong and disagreeable. As soon as the mouth is touched by the remedy, the flow of saliva, and of the mucous secretions of the mouth becomes so much augmented, that the individual is compelled to eject the fluid continually, and where complete ptyalism has set in, the quantity evacuated is occasionally enormous. Eight pounds in the 24 hours have been mentioned by M. Andral, but this is not the limit. Sixteen pounds are said by Most to have been discharged in this way,—the average quantity in health not exceeding four ounces, according to Mitscherlich. This increased flow may exist—to a greater or less extent—for many days or even weeks.

In a specimen of saliva, from a patient who had just terminated a mercurial course of some weeks' duration, M. Simon observed an acid reaction arising from the presence of free acetic acid. It was very viscid, of a yellow colour, and possessed a sickly, disagreeable, acid smell. It contained no mercury. After evaporation to dryness, all the acid reaction had disappeared, showing that it had no free lactic acid.

It contained a very large quantity of semifluid fat, a considerable amount of albumen, and traces of caseous matter. Under the microscope, an immense number of fat vesicles were seen, with some epithelium cells, and a very few partially destroyed saliva-corpuscles. 1000 parts of this saliva were composed of

Water, ...	974·12
Solid constituents, ...	25·88
Yellow viscid fat, ...	6·94
Ptyalin with extractive matter and traces of casein,	3·60
Alcohol extract with salts, ...	7·57
Albumen, ...	7·77

On contrasting this saliva with the normal fluid, "we are struck," says M. Simon, "with its large amount of solid constituents, arising not from any increase of the ptyalin, but of the fat, the extractive matters, the albumen, and the salts." MM. L'Heretier and Wright found an unusual quantity of mucus in the saliva of mercurial ptyalism.

At one time, the effect of the remedy in syphilis was measured by the quantity of saliva discharged:—if the disease were of a certain duration the patient must spit a quart; if of a longer, two quarts,—and so on; but now, since the conviction of the practitioner is, that salivation is rarely or never necessary, and that it is rather to be deplored,—inasmuch as the increased discharge exhausts and irritates, without being of itself beneficial,—the practice has been abandoned, and if we meet with excessive ptyalism, it is generally in those who are easily affected by mercury and in whom the affection supervenes rapidly; or in those whom the remedy has, by accident, been persisted in for a longer period than was contemplated. The books were formerly filled with descriptions of the horrible accidents induced by mercurial ptyalism, some of which the author has witnessed;—as extensive sloughing, loss of teeth, caries of jaw bones; protrusion of the tongue from the mouth; adhesions of the tongue and cheeks, &c. &c.; with, at times, excessive febrile irritation, marasmus, and death. This last event was, however, uncommon. Usually, after a tedious convalescence, the sufferer was restored to health, but occasionally the system received an injury from which it never wholly recovered.

Although the plan of exciting profuse salivation for the cure of syphilis may now be considered as generally and properly exploded, and, therefore, these cases of ptyalism are comparatively rare, we still now and then observe the deplorable effects of mercury pushed with equal incaution for the treatment of many of our bilious and other fevers. Not many years ago, an interesting case fell under the author's care, in which the lower jaw became firmly closed in consequence of the formation of ligamentous bands, and of the contraction that had occurred during the cicatrization of mercurial ulcers of the mouth; the bones of the jaw were carious, and portions of them exfoliated; yet, by careful management,—improving the general habit, and separating the jaws gradually by an instrument contrived for that purpose,—they became movable. Within the last few years, the author has known of other similar cases, the subjects of which had sought Philadelphia for surgical relief under their deformities.

Causes.—The term mercurial ptyalism sufficiently indicates the exciting cause; but a few remarks are necessary on predisposition. Unquestionably, age has its influence. It is almost impossible,—wholly so, perhaps, in most cases,—to salivate a child under two years of age. There is something in the peculiar evolution of organs at this age that prevents it; yet after the age of two, children become very susceptible of mercurial influence, and remain so, although not perhaps to an equal degree, throughout the remainder of existence. There is, likewise, a marked difference in individuals as to their susceptibility to the action of mercury,—some being affected by the smallest quantity, whilst it is impossible to salivate others by any amount. Temperature has some effect, and exposure to cool air. In hot weather, especially if the individual take exercise, the mercury appears to pass off by the cutaneous transpiration; and, on the other hand, the repression of the transpiration frequently induces ptyalism. Constipation also appears to favour the action of mercury, as diarrhœa usually prevents or retards it.

It is not easy to account for the action of mercury in inducing ptyalism. It obviously enters the blood, for it has been detected in that fluid; and, in this way, it may excite a new action not only in the salivary glands, but apparently, in almost all the secretory organs of the economy. Its first effect, however, is exhibited in the mucous membrane of the mouth; and hence mercurial stomatitis precedes mercurial ptyalism. M. Grisolle affirms, that the greater portion of the fluid which escapes from the mouth is furnished by the follicles of the mucous membrane; but such does not appear to be the fact. It is evidently mainly salivary. M. Andral examined the condition of the blood in some cases of mercurial stomatitis, but did not discover any difference between it, and the blood of other inflammatory affections. He never witnessed a diminution of fibrin, as is supposed to follow its use by those who prescribe it in certain diseased conditions to diminish the plasticity of the blood in diphtheritis, for example, and, indeed, in the inflammatory affections in general.

Treatment.—If the febrile and inflammatory symptoms run high, bloodletting—general and local—may be demanded; but this can seldom be the case. It is a favourite remedy, at the commencement, with one distinguished individual, M. Cullerier. Generally, it is best to administer saline cathartics, which act in a twofold manner, both as depletives and revellents.

℞.—Magnes. sulphat. ℥vj.
Aq. menthæ pip. f℥iv.—M.
Dose, one-fourth, night and morning.

They should be given to the extent of producing at least two or three liquid evacuations in the twenty-four hours, for the first two or three days, unless their use is contraindicated. The preparations of sulphur—sublimed sulphur, and sulphuret of potassium—combined, or not, with sulphurous baths, have been long prescribed; under the idea, that the sulphur would exert some chemical agency in modifying the action of the mercury. Few entertain this opinion at the present day: sublimed sulphur is, however, a gentle and pleasant laxative, and may be given with that view.

In the early period of the disease, emollient and warm collutories are found to be the most soothing. These may consist of mucilage of gum arabic, flaxseed tea, infusion of the slippery elm, and similar mucilaginous articles; but, in the after stages, greater advantage is derived from agents of a more excitant character. Various mineral and vegetable astringents have been used for this purpose, such as the acetate of lead, the sulphate of zinc, and the sulphate of alumina and potassa. A case of mercurial ptyalism, occurring in a child four years of age, which had continued for two months and a half, and had resisted all the usual remedies, yielded to warm baths acidulated with equal parts of nitric and muriatic acid, prescribed by Dr. Baumgartner; and recently, Dr. Robertson, of Harrodsburg, Kentucky, has affirmed, that one of the commonest plants in that part of the country—*Ambrosia trifida*, known under the popular names of "Horse-weed" and "Horsemint"—affords more prompt relief in mercurial ptyalism than anything he had used previously. He employs an infusion of the green leaves as a gargle and mouthwash. The author thinks that he has derived as much benefit from the solution of chlorinated lime, and from that of creasote, as from any other agent. It must be borne in mind, however, that the art of medicine, in the generality of cases, does not appear to possess much power over the disease, and that whatever internal or external remedy is employed, *time* is an essential element in the cure. A collutory of chlorinated lime not only appears to diminish, in many cases, the excessive secretion from the salivary glands, but speedily mitigates the sense of burning in the mouth, induces the healing of the erosions of the mucous membrane, and corrects the mercurial fœtor.[a] If either this, or the creasote wash,[b] should be too stimulating, it must be reduced by the addition of water.

[a] R.—Calcis chlorin. ʒj.
Aquæ Oj.
Vini opii f ʒiss.—M.
The mouth to be well washed with a little of this solution, six or seven times a day.

[b] R.—Creasot. gtt. xxx.
Aquæ Oj.—M.

Pure tannin, moistened and smeared upon the spongy gums, is said by Dr. Watson to be remarkably efficacious in rendering them firmer and more comfortable; but this—as he remarks—is not always to be procured; and when the flow of saliva and soreness of the gums formed the chief part of the grievance, he has found nothing more generally useful than a gargle made of brandy and water, in the proportion of one part of brandy to four or five of water. By many, the internal use of iodine has been highly extolled; yet, in the experience of others, its efficacy has been doubtful. It may be given in the form of the tincture, (ten drops, three times a day, in gruel.)

If ulcerations exist, and they resist the local management above directed, they may be treated upon the plan advised under the head of Stomatitis. M. Ricord prefers applying strong muriatic acid to the ulcerations, repeating the application every day, or every other day,—the bleeding of the surface presenting no obstacle. The acute pain it produces soon ceases, and nothing, he thinks, equals its beneficial

effects. When used at the commencement of the stomatitis, it would seem to have frequently arrested it. With this view, a mop of lint dipped in pure muriatic acid, may be applied gently over the portion of the mucous membrane, which is beginning to be tumefied, taking care to clean the teeth well, should the acid have touched them. Three or four applications of the acid, at proper intervals, will, at times, change the whole action of the mucous membrane so as to cause the salivation to abate. Such is the plan strongly advised by MM. Ricord, Baumès of Lyons, and M. Grisolle. On the other hand, M. Requin objects to it, and advises the treatment by simple astringents. The author has occasionally employed it advantageously both at the commencement of the stomatitis, and when ulcerations have occurred; but, like every other remedy in a disease essentially self-limited, it has failed.

Should the pain be so severe as to preclude rest, opium or its preparations may be freely administered.

The diet, throughout the severity of the disease, should consist of farinaceous substances; but, later on, milk, broths, and the lighter preparations of animal food may not only be permitted, but be advisable.

The salivary glands, and especially the parotid, are liable to *cancer*, and other *morbid transformations*, and their ducts to various diseased conditions; but as these belong rather to the domain of surgery, they are passed over here. Their pathology is the same as that of similar affections of the pancreas, to be next considered.

CHAPTER II.

DISEASES OF THE PANCREAS.

The pancreas or "sweet bread" is so like the salivary glands in structure and functions, that it has been called by some the "abdominal salivary gland." Its position must be borne in mind, which is transversely in the abdomen, behind the stomach, and towards the concavity of the duodenum. It is, on the average, about six or seven inches long, and weighs from two and a half to three or four ounces. Of six observed cases, the mean weight, according to Professor Gross, was two and a half ounces, and the mean length seven inches. In thirty-two other cases, however, M. Bécourt found the average length eight inches, and the weight between three and four ounces, French. Its excretory ducts all terminate ultimately in one—the duct of Wirsung—which opens into the duodenum,—at times, distinct from the ductus communis choledochus, but close to it; at others, confounded with, or passing into it.

Its consistence at different periods of life, does not vary greatly; but, like the salivary glands, it becomes materially modified by disease.

Dr. Claessen, of Cologne, who has written a good monograph on the diseases of the pancreas, doubts the accuracy of the general opinion that they are very rare. He thinks, that the opinion has arisen from the difficulty of diagnosis. In confirmation of this view, he states, that although he had, without difficulty, collected reports of 300 cases in which disease of the pancreas was discovered after death, he had found only 20 in which the physician had ventured, from symptoms alone, to announce the existence of disease of that organ; and in very few of these the diagnosis appeared to have been correct.

The character of the fluid secreted by the pancreas doubtless varies largely in disease, but we are not aware of the nature of the changes which it experiences.

In 1839, the number of deaths from diseases of the pancreas in England and Wales is stated by Mr. Farr to have been 4.

I. INFLAMMATION OF THE PANCREAS.

Synon. Inflammatio pancreatis, Pancreatitis; *Fr.* Pancréatite, Inflammation du Pancréas; *Ger.* Entzündung der Bauchspeicheldrüse, Bauchspeicheldrüsenentzündung.

It is only of late years, that the diseases of the pancreas have been much investigated. In the year 1812, an *ex professo* treatise was published on the subject by M. Harless, and, a more complete monograph, by M. Mondière, has since appeared, which received a prize from the *Société Médicale d'Emulation* of Paris. The author last cited, is of opinion that acute inflammation of the pancreas is more common than is generally believed; yet, it is unquestionably, very rare.

Diagnosis.—The symptoms assigned to this disease, are;—a disagree-

able feeling of oppression, and dull pain, deep in the epigastrium, which is fixed, and increased when the stomach is filled, on full inspiration, and when strong pressure is made on the abdomen. The epigastric region is at times swollen, and the functions of the stomach are greatly disordered; more or less anorexia and evidence of dyspepsia exists; and there is, occasionally, a copious vomiting of matter, having the appearance of saliva,—as well as diarrhœa, constituted, at first, of a mixture of aqueous and bilious matters with the aliment, and, subsequently, of fluid like saliva. When the tumefaction of the pancreas is considerable, the pulsations of the aorta are conveyed forcibly to the hand placed on the epigastrium. Along with these symptoms, there is more or less general febrile irritation, as in other phlegmasiæ of the abdominal organs. None of these can be looked upon as pathognomonic; nor do they, when taken together, lead to more than a probability that pancreatitis exists; yet the probability is so strong, that it may be unhesitatingly acted upon.

The disease rarely proceeds to suppuration: more frequently, it terminates in induration, of which the author has seen many examples. The termination in gangrene is very rare.

Causes.—Pancreatitis may—like inflammation of the salivary glands—be idiopathic; but, doubtless, it more frequently arises from diseases of the stomach or duodenum. It is often, especially in the chronic form, connected, also, with disease of the liver; and, in the majority of instances, the two diseases will be found to acknowledge the same cause. The constant irritation of the stomach and duodenum in drinkers of alcoholic potations may be propagated along the duct of Wirsung to the pancreas, as it is propagated along the common choledoch duct to the liver, so that the functions, carried on in the capillary system of the pancreas, may be morbidly implicated simultaneously with those of the liver.

Pathological Characters.—In the few cases of acute pancreatitis that have been examined after death, the pancreas has been found red and swollen, and sometimes of greater, but at others, of less consistence than in health.

Treatment.—Where acute pancreatitis is suspected, it must be met by bleeding—general and local—and the whole antiphlogistic plan. The only caution, needed, is in the administration of violent cathartics. whose exciting action could scarcely fail to be extended along the pancreatic duct, and to add to the irritation. It is sufficient to keep the bowels daily open by the gentlest laxatives, or by enemata.

Chronic pancreatitis has been more frequently described than the acute. It may be the result of the acute form, or may exist from the first, and it is a more frequent concomitant of diseases of other organs of the abdomen. In one case, in which an opportunity occurred for examining the body after death, the symptoms were;—copious evacuations of fluid from the bowels, which was regarded as resulting from an increased secretion of the fluid of the pancreas. At a later period, constipation supervened, and, ultimately, a tumour was perceptible in the epigastric region. On dissection, the pancreas was found red, swollen, and as soft as a sponge; the duct much dilated.

It weighed, according to Schmackpfeffer, seven ounces. In other cases, it has acquired a great increase in density.

The pancreas is also liable to various transformations, as the *adipose* or *fatty; the encysted;* the *scirrho-cancerous;* the *encephaloid;* the *tuberculous;* the *melanotic;* the *calculous*, &c. &c.; of which MM. Mondière and Claessen* have given ample descriptions; but there are no phenomena that positively indicate their presence, and they are, consequently, most interesting in their relations to pathological anatomy.

Various diseases have been ascribed to an increased secretion of the fluid of the pancreas. It has been suggested, indeed, whether cases of enterorrhœa be not of this nature. Others have referred most forms of diarrhœa to this cause; and a distinguished surgeon, M. Dupuytren, has suggested, whether the pancreas may not furnish the matter evacuated by persons labouring under cholera. It has, moreover, been presumed by M. Mondière, that the fluid of pyrosis may proceed from the pancreas. We cannot say, that these speculations are altogether devoid of foundation, or that they are irrational; but it may be averred, with safety, that the observed phenomena and arguments in their favour are by no means convincing.

* A good analysis of the work of this observer, entitled *Die Krankheiten der Bauchspeicheldrüse*, u. s. w., is contained in the British and Foreign Medical Review, for Oct. 1844.

CHAPTER III.

DISEASES OF THE BILIARY APPARATUS.

The apparatus for the secretion of bile consists of the liver and hepatic duct; the gall-bladder and the cystic duct; and the common choledoch duct, formed by the union of the hepatic and cystic ducts.

The *liver* is situate in the right hypochondriac region, and more or less in the epigastrium. Its ordinary weight is three or four pounds; and in health it probably never exceeds, materially, the latter. In disease it has been known to weigh 20 or 25 pounds; and, in other cases, not as many ounces. The connexion or proximity of the organ to other organs must be borne in mind. Its upper convex surface touches, everywhere, the arch of the diaphragm. The lower concave surface corresponds to the stomach, colon and right kidney. It receives—it will be recollected—two kinds of blood—that of the hepatic artery, and that of the vena porta. The common opinion is, that the former is intended for the nutrition of the liver; the latter for the secretion of bile. For reasons elsewhere given, (*Human Physiology*, 6th edit. ii. 298, Philad. 1846,) the author has been disposed to embrace the view, that as in the case of other secretions, the bile is formed from arterial blood; and that the arrangement of the portal system is for the purpose of mixing thoroughly the various heterogeneous fluids, which are readily absorbed from the mucous membrane of the stomach and duodenum, so that they may not be sufficiently concentrated to act injuriously on the heart when they reach that organ.

Besides the radicles of the hepatic artery and the vena porta, the liver consists of the following anatomical elements;—the various terminations of the excretory or biliary ducts, which are probably blind at their extremities, having the capillary vessels that secrete the bile ramifying upon them;—lymphatic vessels;—nerves, some proceeding from the pneumogastric, but the majority ganglionic;—the supra-hepatic veins, which, according to common belief, communicate both with the final ramifications of the hepatic artery, and the vena porta, and return the blood to the heart. All these parts, united together by cellular substance, constitute the liver, which has two coats,—the outermost peritoneal, and the innermost cellular, and forming the proper coat. The former does not cover the posterior part of the organ, the excavation for the gall-bladder, the vena cava, and the fissures in the concave surface. The latter invests not only every part of the surface of the liver, but the large vessels that are proper to it.

The colour of the liver differs in health according to age and various circumstances. In the adult it is generally of a reddish-brown colour, with bluish spots, especially on the anterior margin and the under surface, dependent probably upon cadaveric hyperæmia. When it is torn, it exhibits the appearance of numerous granules, each of which probably consists of the anatomical elements mentioned above,

packed together so as to constitute one of the myriads of glands inservient to the biliary secretion. In certain cases of disease, this granular arrangement becomes very manifest.

The situation of the *gall-bladder* must be kept in mind. It is at the inferior concave surface of the liver, with which it is connected; and above the colon and the duodenum. The largest part or fundus is turned forwards; and, when distended, it frequently projects beyond the anterior margin of the liver. Externally, it is partly covered by the peritoneum, which attaches it to the liver, and to which it is moreover adherent by cellular tissue and vessels. Connected with its diseases, it is important to remark, that it has, at least a mucous coat, which extends down its duct — the cystic, and into the common choledoch duct; and a coat, which is exterior to this, between the mucous and the peritoneal coat, which is contractile. Without this belief, it would not be easy to explain certain phenomena in disease; and, besides, pathological anatomy has sufficiently demonstrated the existence of fibres, which must have been contractile.

The *hepatic duct*, which is formed by the union of all the excretory ducts of the liver, is constituted anatomically like the cystic duct; and the same may be said of the common choledoch duct. The hepatic and cystic ducts are about the same length—an inch and a half,—and about the size of an ordinary writing-quill. The common choledoch duct is about three or three and a half inches long. It descends behind the right extremity of the pancreas, through its substance, passes for an inch obliquely between the coats of the duodenum, and opens at the inner surface of the intestine, at the distance of three or four inches from the stomach. Towards its termination, it diminishes in diameter, and its orifice in the duodenum is more contracted than any other portion.

As in the case of the pancreas, a continuous surface exists between the interior of the duodenum, the gall-bladder, and the minutest radicles of the biliary ducts in the liver; so that it can be readily understood, how much the condition of the biliary apparatus is connected with that of the intestinal canal. To this subject, however, reference will have to be made in the consideration of the various diseases of the apparatus.

In regard to the fluid secreted by the liver, it differs according as it proceeds directly from the liver along the hepatic duct, or has been retained in the gall-bladder. The latter possesses greater bitterness, and is thicker, and of a deeper colour; but they do not differ much from each other, except in the greater concentration of the different elements in the latter. We know not the amount of bile excreted in the course of 24 hours: it will be readily understood, however, that it must vary greatly. The presence of food in the stomach and duodenum during digestion is a natural excitant to the liver; but if the mucous surface of those organs be in a morbid condition, the quantity and quality of the secretion may be materially modified. We are but very imperfectly informed, however, in regard to the alterations which the bile experiences in disease.

In 1839, the mortality from diseases of the biliary apparatus,

throughout England and Wales, is stated by Mr. Farr to have been 3990.

I. HYPERÆMIA OF THE LIVER.

Synon. Hyperæmia hepatis, Congestion of the liver, Hepatic engorgement; *Fr.* Hyperémie du Foie, Hépatohémie, (*Piorry*); *Ger.* Blutanhäufung der Leber, Blutüberfluss der Leber.

At a time when it was the custom to refer more diseases to the liver than has been sanctioned by subsequent and sounder observation, congestion of the liver was supposed to account for many morbid phenomena, which did not admit of ready explanation. No term, indeed—as elsewhere remarked—in the whole range of medical terminology, has been employed with less precision than *congestion*.

As regards hyperæmia of the liver, it is probably induced, generally, as hyperæmia is elsewhere, by disease in some part of the circulatory organs, which prevents the blood from returning regularly to the great central organ of the circulation. The hyperæmia under consideration perhaps always consists in some obstacle to the passage of the blood through the right cavities of the heart, which gives occasion to an accumulation in the hepatic vessels.

Diagnosis.—Should hyperæmia of the liver exist to any extent, it is to be presumed, that the size of the organ will be augmented, so that it may extend below the cartilaginous margin of the ribs, towards the left side, or force the diaphragm upwards. In such case, the *jecoral sound*—as it has been termed by M. Piorry—on percussion, would be heard over a larger space. There may, likewise, be more or less difficulty in lying upon the left side. These, it is presumable, would be the signs of simple hyperæmia of the liver, which, moreover, may supervene rapidly, and disappear as rapidly when the impediment to the circulation is withdrawn. When the hyperæmia is active, the symptoms will be essentially those of inflammation of the liver.

Pathological Characters.—Minute researches induce their author, Mr. Kiernan, to affirm, that the usual appearance in a healthy liver, of darker spots mottling a yellow parenchyma, results from congestion of the hepatic veins,—the congestion, beyond a certain limit, constituting an abnormous condition—a state of disease; and, on the other hand, when congestion of the portal system is alone present, the peritoneal surface of the liver, or a section of the liver, displays the appearance of yellowish spots mottling a dark parenchyma. In the former case, the central vessels of the lobules are congested; in the latter, the vessels in the interlobular spaces. Again, when hyperæmia of both sets of vessels exists, the yellow colour disappears from every part of the liver, from the lobules as well as from the interlobular spaces. They who believe in the existence of two distinct substances in the liver, ascribe the mottled appearance to one of the substances being in a state of hyperæmia, whilst the other is unaffected. (See Cirrhosis of the Liver.)

In another work, the author has given at length the views of Mr. Kiernan, which are generally but not universally admitted, and has inserted representations of both the *hepatic* and *portal* venous conges-

tion; (*Human Physiology*, 6th edit. ii. 288, Philad. 1846.) It is there stated, that Mr. Kiernan's observations explain the different statements of anatomists concerning the red and yellow substances of which the liver has been considered to be composed,—the red substance being the congested portion of the lobules, which, as seen in Mr. Kiernan's figures—may be either interior, or exterior, or irregularly disposed—the yellow being the non-congested part, in which the biliary plexus is seen more distinctly.

Hyperæmia of the liver is said to be a common affection in India; and, wherever met with, we might expect the colour of the organ to be darker than in the healthy condition, owing to morbid accumulation of blood. When in this state, its texture is usually softened, and the section made with a knife bleeds freely. The peritoneal surface, in such cases, is often marked with numerous clusters of minute vessels—"like the veins on the nose of an old gourmand," according to Mr. Twining.

Treatment.—The attention, in cases of hyperæmia dependent upon disease of the heart, must be directed almost wholly to the latter organ: where, however, there are signs of activity of circulation, it will be advisable to apply cups or leeches over the region of the liver, and to give cathartics occasionally, which, by acting upon the lining membrane of the intestines, occasion watery discharges at the expense of the portal system.

℞.—Pil. Hydrarg. gr. v.—at bedtime.

℞.—Infus. sennæ f℥x.
Tinct. sennæ f℥j.
Magnes. sulph. ℥iij.—M. f. haust.
To be taken the following morning.

Where general bloodletting is considered advisable—as it often is—it is a valuable aid to diagnosis; for almost immediately after the operation, according to M. Piorry, percussion will exhibit, that there is a diminution in the size of the liver.

II. INFLAMMATION OF THE LIVER.

Synon. Inflammatio hepatis, I. jecoris, Hepatitis, Febris hepatica inflammatoria, Empresma hepatitis; *Fr.* Hépatite, Inflammation du Foie; *Ger.* Leberentzündung, Entzündung der Leber.

Inflammation of the liver may be considered under two forms,—the *acute* and the *chronic*; —for although the former may terminate imperceptibly in the latter, the essential phenomena of the disease may be chronic from the first.

a. *Acute Inflammation of the Liver.*

Synon. Hepatitis acuta.

This is certainly an uncommon disease in temperate regions, whilst in torrid climes it is by no means unusual.

Diagnosis.—The prominent symptoms of acute hepatitis are,—pain, at times acute and lancinating, at others, dull and heavy, in the right hypochondrium, frequently extending to the chest, and as far as the shoulder of the same side; the pain in the right hypochondrium is increased by pressure, inspiration, coughing, and lying on the left side;

and, on the contrary, is relieved by lying on the side affected. The pain in the right shoulder has, by many, been esteemed pathognomonic; but there is reason to believe, that it is a very equivocal sign, and—having been observed in a few cases—it has been copied from one author to another as diagnostic of hepatitis. In some cases, the size of the liver is augmented; this state may be detected by the signs described under hyperæmia of the liver, and especially by percussion, when the dull *jecoral* sound will be heard over a larger space than usual. The functions of the liver are necessarily modified, and their morbid alterations are detected chiefly by the condition of the alvine and urinary evacuations, and the colour of the skin. Early in the disease,—as in the case of other secretory organs when inflamed,—the secretion of bile is mainly or wholly arrested; the alvine evacuations, under such circumstances, are ash or clay coloured; but commonly the bowels are constipated. The urine is high coloured, so much so as to tinge the linen yellow, and the skin and whites of the eyes exhibit a yellow hue,—symptoms which indicate an approach to, if not the actual existence of, jaundice.

The urine, however, in acute hepatitis, has been differently described by different observers. According to MM. Simon, Becquerel and Schönlein, it possesses the main characteristics of that of the phlegmasiæ in general. It is scanty, and has an acid reaction, is of a dark reddish-brown colour, and deposits a copious red sediment of urate of ammonia and uric acid. On the addition of nitric acid, the brown colour changes to a decided green. It likewise becomes turbid on the application of heat, so that it contains both biliphæin and a little albumen.

It is not uncommon for the duodenum and stomach to participate in the inflammatory condition, and should this not be the case, the alimentary canal may be sympathetically irritated to a greater or less extent; the patient is affected with vomiting, pain, and tension in the epigastrium, bitter taste in the mouth, yellow furred tongue, and thirst. The accompanying fever is usually highly inflammatory; the skin is hot, and the pulse full and bounding.

The relative frequency of the symptoms, described above as indicative of acute hepatitis, was noted by M. Roche in *sixteen* cases. *Eleven* times, there was pain in the right hypochondrium; *once*, pain at the top of the right shoulder; *five* times, tumefaction of the hypochondrium; *nine* times, jaundice; and *five* times, there was no local symptom. In all, there was fever, but it was not always the same; it was continued in *thirteen* cases, and paroxysmal in *three*. There is truth, consequently, in the opinion, that although no one of the symptoms can be esteemed pathognomonic, yet when taken together they can scarcely fail to lead to a satisfactory diagnosis.

It has been a question with observers, whether inflammation of the convex surface of the liver present symptoms differing from those that belong to inflammation of the concave surface. Perhaps, in the generality of cases, the pain—in the former—will be found more acute and lancinating, and more increased on inspiration, coughing, and pressure; whilst, in the latter, it is more deep-seated; it is little, if at all, aug-

mented on pressure, and efforts at vomiting always increase it greatly. Differences of this kind may, and do, exist, and yet we may have to pronounce on the precise seat with caution. The more superficial the inflamed surface,—that is, the nearer it is to the abdominal parietes,—the more likely will it be to be indicated by the signs given above.

When the inflammation is seated at the surface of the liver, constituting *sero-hepatitis*, the pain is more severe than when it exists deep in the parenchyma of the organ, constituting *puro-hepatitis*. This has been laid down as an illustration of a general law, that if we consider inflammatory affections of the solid viscera, we shall find that the more superficial the inflammation the more painful it is; and, on the other hand, the more deep-seated it is, the more is it latent, so far as pain is concerned. One author, Mr. G. H. Bell, states, that in the sero-hepatitis of India, the patient is attacked with sudden pain in the region of the liver, and this is so severe, that even the weight of the bed-clothes is insupportable, nor can he bear to turn or lie on his left side owing to the pressure exerted in that position on the inflamed organ. But in puro-hepatitis, the affection may proceed in such a latent manner, that the first symptoms of liver disease may be those of suppuration. This assertion has been confirmed by the experience of Mr. Annesley, and by a succession of cases of hepatic abscess, which were under treatment at the Meath Hospital in 1828, by Dr. Stokes.

Acute inflammation of the liver may terminate in various ways. Like all acute phlegmasiæ, it may pass off by resolution, or end in suppuration or gangrene, or proceed to the chronic state. When it terminates by resolution, the symptoms gradually disappear, and if percussion over the region of the liver had shown the existence of dulness of sound over a greater extent of surface than in health, successive percussions will now show that the enlargement of the liver is gradually subsiding. When the inflammation is about to end, or has ended, in suppuration, the fever becomes hectic; the hepatic tumour continues, or even becomes augmented in size, and a feeling of increased weight is complained of in the region of the liver. Considerable importance, too, has been attached to pain in the right shoulder as a sign of hepatic abscess. It was absent, however, in five cases observed by M. Louis; and M. Andral places no stress upon it as a diagnostic symptom. Mr. Annesley regards it as a sympathetic pain, indicating that the abscess is in the right lobe of the liver, and Dr. Budd is disposed to agree with him. It is very questionable, however, whether it be entitled to more consideration than in inflammation of the liver. Where adhesion has taken place between the peritoneal coat of the organ and the peritoneum proper, the matter may make its way towards the surface, and fluctuation, with decided pointing, be perceptible. This is the ordinary course of the formation of hepatic abscesses with us; but, occasionally, even in temperate climes, the abscess forms rapidly, and with symptoms which might seem to belong to the early stage of the disease.

The most prevalent form of acute liver disease, in Bengal, is inflammation, with tendency to central abscess. A very common symptom of the incipient stage of this tendency in the right lobe of

the liver is said to be,—a much greater degree of tension of the right rectus abdominis muscle, than of the left,—the muscle on the right side resisting pressure by a quick involuntary action, whilst the left rectus is lax, and other parts of the abdomen of the patient are comparatively soft and elastic. Mr. Twining considers this one of the most undeviating symptoms of congestion, with incipient interstitial deposit into the texture of the liver, which commonly goes on to deep-seated abscess, unaccompanied by urgent signs of pain or pyrexia. In these cases, suppuration is often established, when it is not indicated by any symptoms except those that are present in the early stages of hepatitis. Unless the abscess makes its way externally through the parietes of the abdomen, or through the stomach, duodenum, colon or air-passages, suppuration of the liver is almost always fatal. The termination in gangrene is very rare, and is always rapidly fatal. It is announced, according to M. Andral, by the sudden cessation of pain, sinking of the pulse, cold clammy sweats, coldness of the extremities, hiccough, and rapid alteration of the features. This mode of termination has, however, been called in doubt, yet it occurs occasionally.

It has been often observed, that the proportion of fat in the blood is considerably increased in hepatitis, and Dr. Traill found the serum milky on several occasions. Hasse has occasionally seen it so highly coloured with biliphæin as to tinge paper dipped in it, and Lauer observed that a yellow coloured sediment was deposited by the serum upon the buffy coat.

Causes.—Excessive heat unquestionably predisposes to hepatitis; hence it is, that the disease is much more common in the torrid regions of the globe, than in the temperate or frigid. Excessive heat, alone, produces erethism of the mucous membrane of the stomach and intestines,—as has been elsewhere remarked,—and this erethism is readily propagated to the liver. The mode in which the livers of the geese are enlarged, at Strasburg and Metz, with the view of forming the *patés de foies gras*, is illustrative of this subject. They are crammed up to the neck with food, are nailed to a board, and exposed to the heat of a strong fire, until, with the aid of punctures made through the parietes of the abdomen to penetrate the liver, but more frequently without this last refinement of cruelty, the livers are enlarged to correspond with the desires of the gourmand. The heat is, doubtless, in this case, a predisponent, by enervating the digestive organs, whilst the enormous quantity of aliment excites the stomach and duodenum, and from these the excitement is conveyed to the liver. It can hence be understood, that in the torrid regions of the globe, repletion of any kind, and especially by stimulating aliments, may be likely to induce the affection under consideration; yet where hepatitis prevails to an unusual degree, local influences must be combined with elevated temperature in the causation. This is proved by the fact, that the average annual per centage of hepatitis, in the East Indies, is, according to Mr. Annesley, at least treble what it is in the western hemisphere. It would appear, too, from the statistical report of the British troops in the West Indies, that although diseases of the

liver are by no means so common amongst the troops in that service as amongst those employed in the tropical regions of the eastern hemisphere, they are nearly three times as prevalent as amongst troops in Great Britain and Ireland, and occasion about five times as high a rate of mortality. Yet, what confirms, again, the influence of locality in addition to elevated temperature, that those diseases vary materially in prevalence and severity, at different stations in the West Indies,—occasioning, at Grenada, for example, three times as great a mortality as at most of the other islands. In Jamaica, notwithstanding the high degree of atmospheric heat, they are by no means very prevalent or fatal, and many ports of the island are remarkably exempt from them. It would seem, too, from the statistical report, that the mortality in the West Indies, from these diseases, is much less amongst the black than amongst the white troops.

In certain parts of the globe, and especially in the East Indies, the causes are of such universal application, that hepatic disease in animals is by no means unusual. Animals, carried to India from more temperate climes, are peculiarly subject to it, and many of them die. Staff-surgeon Blest informed Dr. Stokes, that he had seen many cases of hepatic abscess in dromedaries and horses under these circumstances. In temperate climates, the most common causes of acute hepatitis are such as act mechanically on the liver;—for example, blows on the right hypochondrium, great efforts to raise heavy weights, falls from a height, and penetrating wounds. The hepatitis, thus induced, is almost invariably fatal. For the reasons before mentioned, it will be readily understood, that any excessive irritation of the stomach and intestines may cause it; hence, it is a result of hyperemesis and hypercatharsis, and of gastro-duodenal inflammation, which may be propagated along the biliary ducts, as already remarked, and also—it has been conceived—by the veins, which arise from the stomach and intestines, becoming inflamed, and the inflammation extending along the vena porta to the liver. Inflammation of the rectum has, in this way, been observed to reach the liver, and to induce numerous abscesses in that viscus.

Like other phlegmasiæ, hepatitis would seem to be induced by irregular exposure to cold; and it is asserted to have succeeded to the repercussion of some cutaneous or other irritation or discharge. Europeans, who have recently arrived in India, are very liable to liver diseases from slight exposure to atmospheric vicissitudes, or to the common causes that induce fever in Europe or this country. Habitual intemperance, or dram-drinking, according to the experience of Mr. Twining, is not as common a cause of hepatitis as has been supposed, and it has been affirmed by Dr. Mackintosh, that in temperate climes, it produces diseases of the stomach more frequently than of the liver. The author has had extensive opportunities for observation on this matter at the Philadelphia Hospital, and although he may agree with the writer cited, that acute hepatitis is not common, his whole experience leads him to the assertion, that inveterate habits of drinking spirituous liquors produce death, not by their effect upon the stomach alone, but by the chronic inflammation, and other diseases of the system of nutri-

tion of the liver. The mode of causation is sufficiently evident. The alcohol irritates, and often inflames the lining membrane of the stomach and duodenum, so as to give rise to softening, thickening, and the other results of chronic gastro-enteritis; and the effects of these pathological states are extended along the ducts to the liver, which becomes morbidly implicated. Along with this chain of causation, the alcohol passes readily through the coats of the veins of the portal system by endosmose; and, before it becomes well mixed with the blood of the vena porta, it is distributed through the liver, whose organic actions cannot fail to be unduly excited, and often perverted under the stimulation. It has been observed, by an excellent writer on the diseases of the liver, Mr. Wm. Saunders, that in dram-drinkers, the diseased structure may often be traced from the stomach along the ductus communis choledochus, and that the gall ducts may be so contracted and thickened, that they cannot transmit the bile.

Acute hepatitis is not a disease of infancy. With regard to its comparative frequency in the two sexes, discordance of opinion exists. Whilst some, as M. Andral, affirm, that females are rarely affected by it; others, as Dr. Mackintosh, assert, that in Great Britain, women are more liable to diseases of the liver than men, owing, probably, to their sedentary occupations. It is affirmed by Mr. Twining that in India women are less liable to acute liver disease than men of a corresponding class of society, owing to their more temperate habits of mind, as well as to less exposure to the exciting causes, and more abstemious method of living.

Pathological Characters.—Some difference of sentiment has existed as to whether the liver be augmented in size in acute hepatitis. It has been affirmed, that no increase is perceptible, but others, and the generality of observers, have maintained the contrary. The truth is, that but few opportunities have presented themselves for observing the pathological appearances in acute hepatitis. Generally, perhaps,—especially in the first stage or that of congestion or engorgement,—there is enlargement; but it must be borne in mind, that the liver is, at times, very large in persons, who are unaffected with hepatitis; and if such persons were to complain of symptoms referable to the liver, this increased development of the organ might receive greater attention as a means of diagnosis than it merits. There are cases in which, to employ the language of Dr. Stokes, "there exists, in adults, a persistence of the embryonary condition of the liver." This condition—it is presumed, by the writer cited, and properly we think—is one of the varieties of arrest of development, and is observed in those persons, whose constitutions give manifest indications of scrophula. This additional fact exhibits the importance of having a correct knowledge of an organ in its healthy state, before we can accurately appreciate the pathological appearances; and perhaps we are scarcely justified in indicating any other *post mortem* appearances, as of general occurrence in acute hepatitis, than those of hyperæmia in the earliest stage; of redness with softening; and, at a later period, of infiltration or collections of pus, when the inflammation has ended in suppuration. These collections vary greatly in size and number: at times, they are

not larger than a hazel-nut; at others, they occupy one-half of the viscus. They may be seated near the circumference of, or deep in, the organ, and are usually surrounded by redness, and softening of the hepatic parenchyma. Frequently, the liver is found to have contracted adhesions with the neighbouring parts;—the diaphragm, stomach, duodenum, colon, or the parietes of the abdomen;—the peritoneum serving as the bond of union, through which the matter of abscesses at times makes its way to be discharged externally. At other times, the pus is found in the cavity of the peritoneum, where it has excited fatal inflammation. Tubercular degeneration, in a state of softening, has not unfrequently, perhaps, been mistaken for abscess of the liver. Gangrene of the liver, it has been already remarked, is extremely rare.

Treatment.—As in all cases of active inflammation of internal organs, bleeding is a most important remedy, pushed to such extent, and repeated as often as the symptoms indicate, and the habit of the individual will justify. There is considerable tolerance of loss of blood, and this, indeed, has been regarded by Dr. Marshall Hall as a useful diagnostic. In the early period of the disease, the decisive use of the lancet is important, yet it is not often cut short by it; it is, however, mitigated in violence, and the diminution of the quantity of the circulating fluids prepares the way for other remedies. When the disease is too far advanced, the application of leeches is to be preferred, and after they have dropped off, a warm emollient poultice may be placed over the bites. The leeches may be applied again and again, should circumstances indicate the necessity. If the patient have been liable to hemorrhoids, or if there be reason to believe, that the inflammation is seated at the concave surface of the liver, some of the French practitioners prefer, that the leeches should be applied around the anus; and this form of revulsive bleeding the author has found advantageous in all cases of hepatitis.

Drastic purgatives are of questionable utility. It has been already remarked, that irritation of the lining membrane of the intestines is readily communicated to the liver, and hence, any therapeutical agent that greatly stimulates the canal, and especially its upper portion, into which the biliary ducts open, may add to the hepatitis. Cathartics, however, which like the saline act on the whole tract, and increase the secretion from the lining membrane, without producing too much irritation, are of decided advantage. When the inflammatory symptoms have been reduced by the vigorous employment of antiphlogistics, counterirritants—as blisters—may be applied over the region of the liver, and the prolonged use of the warm bath be prescribed.

It has been a common custom, borrowed from the practice of the physicians of India, to administer mercury largely, so as to induce salivation. Some commence this at the very outset of the disease; but if it be employed at all, it should be prescribed after the inflammation has been reduced by antiphlogistics; its revellent operation may then be of decided benefit.

When the hepatitis has terminated in suppuration, and the abscess is deep-seated, nothing can be done, excepting to meet the general symptoms, and support the individual—if this be necessary—by ap-

propriate diet. Should, however, the collection of matter be superficial, it will be necessary to open it, as soon as practicable, if there be reason to believe, that it is making its way by adhesion to the surface of the body, and if there be no likelihood that, should an incision be made, the matter will be discharged into the cavity of the peritoneum. This is not easily determined, inasmuch as it has been found, that an abscess of the liver may be so large as to form a distinct tumour on the surface, which may be fluctuating, discoloured, and painful, and yet, on dissection, there may not be the slightest trace of adhesion; so that, if paracentesis had been performed, the matter must have made its way into the peritoneum, and been the cause of death. Where doubt exists as to whether adhesions have formed so as to render it safe to open the abscess in the ordinary manner, the plan, proposed by Dr. Graves, may be adopted. It consists in making an incision down to the peritoneal coat of the liver, and filling the wound with lint. This will be followed by the requisite adhesions, and the abscess will probably advance towards the part where the incision is made. When patients have not permitted the abscess to be opened by incision, the potassa has been applied to the most prominent part of the tumour; but it does not appear that there was any advantage in this mode of procedure. On inspecting the bodies of those individuals after death, adhesions of the peritoneal coat of the liver to the parietes of the abdomen have very rarely been found. Where the abscess bursts into the cavity of the peritoneum, the case has to be treated in the same manner as peritonitis produced by rupture or perforation of the intestine.

Care must be taken not to mistake a distended gall-bladder for an abscess. This may be done. An interesting case is referred to by Drs. Stokes and Graves, in which the gall-bladder was actually punctured, under the idea that the tumour formed by it was an abscess. The exploratory needle is now extensively used in India in supposed cases of hepatic abscess.

It has been attempted to induce absorption of the pus by mercury, pushed so as to induce salivation. This, however, is not always easy. It has, indeed, been found, in many instances, impracticable to salivate persons labouring under hepatic abscess, so that it has even been conceived, that the presence of matter in the liver may be determined, in doubtful cases, by the circumstance of the patient being unsusceptible of the full effect of mercury. It is indeed, difficult to induce ptyalism when the organic actions are greatly excited in any part of the economy.

Throughout the whole of the period of activity of the inflammation, the diet must be strictly antiphlogistic; but when the violence of the disease has subsided, mild farinaceous aliment may be allowed, with milk or chicken broth, unless these articles disagree; in such case, one-sixth part of cream, mixed with five-sixths of water, forms an agreeable and nutritious aliment. To allay the thirst, it is best to allow small pieces of ice to be taken into the mouth frequently. Where large quantities of fluid are permitted, especially when bleeding, general or local, has been premised, so as to diminish the quantity

of blood circulating in the vessels, the fluid passes readily through the coats of the stomach and of the veins of the organ, so that in a short time after the bleeding, the portal system may be as full of fluid as it was previously.

b. *Chronic Inflammation of the Liver.*

Synon. Hepatitis chronica, Inflammatio Hepatis lenta, Hepatitis occulta; Chrono-hépatite. (*Piorry.*)

It has been properly remarked, that many of the cases, usually denominated *chronic hepatitis*, differ rather in degree, than in any other essential, from the acute form of the disease; and that they require more perseverance in the use of remedies, although the same active treatment may not be so necessary as in acute cases. There can be no doubt, however, that *liver disease*—as it is commonly called—is by no means as frequent as was at one time supposed; and that many of the morbid conditions, which were looked upon as hepatic, are really gastric or duodenal.

Diagnosis.—The symptoms are essentially like those of acute hepatitis. There is a dull, heavy pain in the right hypochondrium, increased by pressure, by succussion of the body, or by lying on the left side, and it may not be felt except under these circumstances. These symptoms are accompanied by more or less fever, which occasionally has a marked exacerbation in the evening. Sooner or later, the skin usually becomes more or less yellow; the fæces white or clay-coloured, and the urine brown or yellow, depositing a copious sediment. By pressing upon the abdomen, after the inflammation has persisted for some time, the liver may be felt extending beneath the false ribs, and more or less towards the epigastric and the umbilical regions; and, frequently, the right hypochondrium is observed to be manifestly more tumid than the rest of the abdomen. Percussion indicates the existence and extent of this tumefaction. Along with these symptoms, there is generally yellow, furred tongue; want of appetite; nausea and vomiting; and, at times, diarrhœa; in short, disordered function of the stomach and the whole intestinal tract. These are the symptoms usually assigned, and which belong, to chronic hepatitis; but they equally belong to other chronic liver diseases, to be described presently. Many of the symptoms, again, may be absent; nay, few—if any—of them, may be present, and yet chronic hepatitis may, notwithstanding, exist. The pain in the hypochondrium may be the only symptom. It is said, indeed, by M. Andral, that nothing but great itching of the skin may lead to a suspicion of its presence; whilst others, as Dr. Mackintosh, assign an eruption, attacking the face and back between the shoulders, generally in the form of acne, as one of its symptoms; but neither of these cutaneous affections is deserving of much diagnostic weight, especially when taken singly.

Chronic hepatitis may also be confounded with disease of the neighbouring viscera—as scirrhus of the pylorus, chronic disease of the duodenum, and of the pleura when accompanied by effusion; and it may be complicated with one or more of these affections, so as to render the diagnosis very difficult. It is stated on the excellent autho-

rity of M. Andral, that it frequently terminates in suppuration, which in a very great number of cases occurs without being suspected by either the patient or the physician, whilst, in other cases, it is foretold by the symptoms mentioned under acute hepatitis. The author has never met with a case of the kind; and, consequently, such a termination, in these climes, must be extremely unfrequent.

Causes.—These are essentially the same as those of acute hepatitis.

Pathological Characters.—The appearances on the cadaveric examination of a person, who has died under chronic hepatitis, are varied. The most constant is the increased size of the liver. The texture of the viscus is variously changed. Usually, it is indurated, more dense, but more readily lacerable. The colour, too, may differ: it may be brownish, reddish-yellow, slate-coloured, or blackish, in spots or patches. Abscesses may be found, and the same kind of adhesions may exist with the neighbouring parts as in acute hepatitis. Along with the evidences of chronic hepatitis, tubercles, melanosis, cirrhosis, and the different degenerations, to be described hereafter, may be met with.

Treatment.—The management of cases of chronic hepatitis is analogous to that of the acute form. Whatever excites the lining membrane of the stomach and bowels, whether in the way of aliment or medicine, must be sedulously avoided: the plan, consequently, of administering cathartics repeatedly, which are reputed to be cholagogue in their action—or which, in other words, excite the lining membrane of the upper portion of the intestinal canal, is objectionable. The diet must be carefully regulated; leeches and emollient cataplasms be applied to the hypochondriac region, or to the anus, from time to time; gentle laxatives be administered; with counterirritants,—as blisters, the tartarized antimony ointment, or frictions with croton oil; and the warm bath. This plan of treatment, carefully persisted in, will often be entirely successful, but should it fail, revellents of another kind may be demanded. Mercury then becomes advisable, which may be administered either internally, or by way of friction, until the effects of the remedy become perceptible on the mouth.

R.—Pil. hydrarg. gr. iij.—v.
Every night at bedtime.

Or, R.—Hydrarg. chlorid. mit. gr. j.
Ext. taraxac.
—— hyoscyam. aa gr. ij.—M.

If blisters have been employed, the blistered surface may be dressed with mercurial ointment. The author has never found it necessary to push the mercury beyond this point; but actual salivation has been recommended, should the pain continue to be severe, the swelling undiminished, the symptoms obstinate, and no contra-indication—as the presence of scrophula—coexisting. It is proper, by the way, to remark, that in the opinion of certain observers, hepatitis and other diseases of the liver may be induced by mercury, and that in venereal establishments, hepatitis and jaundice have not unfrequently been seen to follow the use of the remedy.

As a revellent, capable of being substituted for mercury in these cases, the internal and external use of chlorine has been advised. Favourable results were obtained from the administration, internally,

of the aqua chlorini, in the Children's Hospital of St. Petersburg. (The author's *New Remedies*, 5th edition, p. 173, Philad. 1846.) When the external agency of the chlorine is desired, the nitro-muriatic acid is commonly employed,—bathing the feet, or sponging the right hypochondrium with it. The form usually advised is the following.

Take of strong nitric and muriatic acids, of each, four ounces: add to these eight ounces of water. Of this mixture, take from two to five ounces, and dilute with three gallons of warm water. When this is used in the form of a pediluvium, the patient should keep his feet in it for 20 minutes or half an hour. If the bath be of proper strength, it will cause a prickling sensation in the skin. Should it not do so, an ounce or two more of the acid mixture may be added to it.

Fumigations of chlorine have a similar agency; and they have been regarded as more certain than ablutions and baths of nitro-muriatic acid. When chlorine is used in this way, it also occasions a prickling sensation; increase of transpiration; a great afflux of fluids to the surface of the body; and, at times, a pustular eruption; increased secretion of saliva, urine, and bile; slight inflammation of the mouth and fauces, &c. It is evident, from this active revellent operation, that the application of chlorine may be serviceable in many diseases, as well as the one under consideration. It has been considered peculiarly adapted for cases of chronic hepatitis, in which mercury has been used irregularly, or for a long period, without benefit; or, where the patient is of a broken-down constitution, and the practitioner is anxious to dispense with the use of mercury.

A strict observance of hygienic rules is all important in this disease. The diet should be unirritating, but moderately nutritive; and as there is generally a desire for fruits and acidulous or acid substances, the taste may be indulged under due precautions. Lemonade forms an agreeable and proper drink. Moderate exercise may be allowed, with travelling, air, and exercise properly adapted to the case. Mineral waters have been advised,—as the Harrowgate or Cheltenham,—or, in other words, the sulphurous or saline class. The trans-Alleghany springs of Virginia, furnish sufficient variety; as well as the Fauquier springs, and those of Saratoga; but the waters are not of the efficacy, in such cases, that has been supposed, and, by disagreeing with the gastric and intestinal organs, they may do positive mischief. The revellent effect of change of air, scenery, and society is unquestionably calculated to be advantageous in long protracted cases of chronic hepatitis; but care should be taken, that the change be to a situation in which the patient can rigidly follow the regimen adapted to his case; otherwise, the resulting evil may more than counterbalance the good.

III. HYPERTROPHY OF THE LIVER.

Synon. Hypertrophia hepatis; *Fr.* Hypertrophie du Foie, Hyperhépatotrophie, (*Piorry*); *Ger.* Hypertrophie der Leber, Uebernahrung der Leber.

Under acute and chronic hepatitis, it was observed, that the liver, owing to hyperæmia, is sometimes greatly enlarged. This is not, however, a case of hypertrophy of the liver. The latter term is applied to augmentation of size, resulting from increase of the tissue of the organ.

Diagnosis.—The symptoms of hypertrophy of the liver vary ac-

cording as the affection is general or partial, and according to the part of the organ that is hypertrophied. If the whole liver be enlarged, a tumour will exist in the right hypochondriac region, and the liver may be detected, both by palpation and percussion, beneath the false ribs; and may, or may not be painful on pressure. Where pain is present, it appears to be owing rather to the traction of the peritoneum than to the condition of the liver itself. The disease is slow in its progress, and may produce more or less disturbance of the digestive function. It has been asserted, that it never proves fatal of itself, but it is easy to see, that it may readily induce other affections, which may destroy life.

It has been affirmed, that, in certain cases of enlarged liver, a loud sound is heard through the stethoscope, between a crepitous rattle and a bleating, and accompanied by a vibration of the parietes of the thorax, communicated to the hand applied to the part; and in one case, it is said, such a sound was caused by the thin edge of the lung being compressed against the costal pleura by an enlarged liver; and, in another, Mr. Malcolmson was able, "by placing the patient in a sitting posture, to remove the symptom, and to let the lung descend a little farther into the chest, and, by pressing the liver forcibly upwards, again to produce it."

Causes.—It is not easy to assign a cause for the increase in the nutritive acts of the liver. In the fœtus, and the infant, a state of hypertrophy of the organ may be esteemed natural; but the proportion diminishes gradually after birth. It has been already observed, too, under hepatitis, that there are certain persons in whom the change does not take place, and who grow up with the liver bearing the same proportion to the other organs as it did in the fœtal condition. Such individuals are generally of a strumous habit.

Pathological Characters.—Hypertrophy of the liver may coexist with various colours of the organ, and with different degrees of consistence. When the liver is hypertrophied in every part, its shape may be preserved; but, in other cases, it may be variously modified. Generally, the hypertrophy is seated in the right lobe; but it may occur in any part of the organ. Various cases of excessively enlarged liver are on record; yet few, if any, were examples of simple hypertrophy. When the hypertrophy has been accompanied by disease, the organ has weighed as much as twenty, twenty-eight, and even forty pounds.

Treatment.—It is not an easy matter to remove the derangement of functions, which gives rise to a loss of balance between deposition and absorption. As the disease, however, is usually associated with scrophula or defective development, it is not advisable to place the patient on too strict a regimen, or to reduce him by powerful remedies. The preparations of iodine would seem to be indicated: they have been used accordingly, and it is said with much advantage. They may be given internally,[a] or be rubbed over the region of the liver night and morning.[b]

[a] R.—Tinct. iodin. seu Tinct. iodin. comp. (Pharmacop. Lond.) gtt. x., ter. die.

[b] R.—Iodin. ʒss. Adipis ʒj.—M. Quantity, the size of a hazelnut.

IV. ATROPHY OF THE LIVER.

SYNON. Atrophia hepatis; *Fr.* Atrophie du Foie; *Ger.* Atrophie der Leber.

Defective nutrition, like supernutrition of the liver, may affect the whole, or a part only, of the organ. It may likewise exist alone from causes affecting the intimate nutrition of the organ, and which are not appreciable; but, most commonly, it is associated with induration or softening.

Atrophy of the liver is understood by pathologists to mean atrophy of the proper substance of the viscus. This may disappear without the whole organ being less; it may, indeed, be larger than natural, owing—as remarked by M. Andral—to the circumstance, that as the proper substance of the liver disappears, it is replaced by cellular tissue. The disease is usually slow in its progress. The patient may, or may not, complain of more or less uneasiness in the region of the organ; his nutrition falls off; the gastric functions are imperfectly executed; the abdomen increases in size; and symptoms of ascites become developed, and exist as long as the individual lives. The ascites is owing to the obliteration of some of the portal and hepatic vessels in the progress of the atrophy, and it is one of the common accompaniments of the affection.

The existence of atrophy of the liver may be suspected by the presence of the symptoms above mentioned; but the diagnosis must necessarily be imperfect; and if it were easy, it would be difficult to suggest any rational plan of management.

V. SOFTENING OF THE LIVER.

SYNON. Hepatomalacia, Malacosis hepatis; *Fr.* Ramollissement du Foie; *Ger.* Erweichung der Leber, Lebererweichung.

Ramollissement of the liver may exist in different degrees, so as not to be perceptible on dissection, except by pressing the parenchyma between the fingers; or when it is to such an extent as to be appreciable by simple inspection;—the tissue of the liver, in the latter case, being liquefied, as it were, and having the appearance as if it had been long subjected to maceration. The sort of red or gray pulp, to which the substance of the organ is reduced, permits the different vessels, distributed through it, to be distinctly seen, owing to their being deprived of their means of union. The softening may exist without any change in the colour of the organ; but, in certain cases, it is black, and has the appearance of grumous blood. In some cases, the organ is of the natural size; in others, it is larger; and in others, again, smaller; and it may affect the whole organ, or only a part of it. It has no diagnostic symptoms, and is a rare affection.

VI. INDURATION OF THE LIVER.

SYNON. Induratio hepatis; *Ger.* Leberverhärtung, Verhärtung der Leber.

When the liver is indurated, it usually exhibits, when torn, a granulated surface. This condition, like softening, may exist with the natural, augmented, or diminished size of the organ; but, generally, the bulk of the gland is much reduced, sometimes nearly to one-half. Its

colour may be various—brown, red, or green, and sometimes it is purple, or lilac. The granules become atrophied—as described under Atrophy of the liver—and, in some cases, they seem to be wholly removed, their place being occupied by cellular tissue, which gives the organ the dull grayish colour. Such a state cannot exist without the obliteration of any of the hepatic vessels and ducts, which may give occasion to ascites, (see Atrophy of the Liver,) and to yellowness of the conjunctiva and of the surface of the body. These symptoms cannot, however, be esteemed pathognomonic.

As the presence of either softening or induration of the liver can only be suspected, the treatment will have to be regulated upon general principles. Both conditions have been supposed to be the results of chronic inflammation. They are certainly lesions of nutrition, but not necessarily connected with an inflammatory process, and certainly not with one, which is indicated by the usual symptoms.

VII. CIRRHOSIS OF THE LIVER.

Synon. Cirrhosis hepatis, Cirrhonosis, Kirrhosis or Kirrhonosis of the Liver, Granulated, Granular, Mammillated. Tuberculated or Hobnail Liver; *Fr.* Cirrhose du Foie; *Ger.* Cirrhose der Leber, Muscatnussleber, Granulirte Leber.

This affection, so called from the yellow colour of the liver, (κιρρος, "yellow,") like the last described, is more interesting in its pathological than in its therapeutical relations.

Diagnosis.—There are no symptoms, which can lead to more than a suspicion of its existence, and when such symptoms are present, they are equally referable to induration and to atrophy of the organ. The region of the liver may afford no symptoms or signs: ascites, however, appears to be a universal concomitant, and commonly œdema of the lower limbs also,—the latter succeeding to the former. M. Becquerel affirms, that when the reverse is the case, Bright's disease of the kidney or disease of the heart is always indicated. The dropsical effusion into the abdomen usually occurs slowly; and if it should take place to such an extent as to require paracentesis, it is quickly re-established after the operation. In some cases,—it has been estimated, by M. Littré, in about one-third,—jaundice coexists; but in other cases, there is simply a yellow tint of the skin and conjunctiva. It has been affirmed, indeed, that icterus is not one of its comcomitants or consequences, but this is an error. In process of time, the nutrition of the body becomes so much affected, that marasmus is established, and the individual gradually sinks.

Causes.—The most common cause of this, as well as of every chronic disease of the liver, is the abuse of spirituous liquors. In all the few cases of cirrhosis, which have fallen under the author's care, the subjects have been dram-drinkers; and this accords with the experience of others. It can be understood, however, that other affections of the liver,—hyperæmia, chronic hepatitis, &c.—may lead to the same result. M. Becquerel conjectures, that it may arise from active and long-continued congestion of the liver, consequent upon chronic disease of the lungs or heart, with the affections of which organs cirrhosis is often complicated. The immediate causes of the

disease are, however, unknown. It appears to be met with more frequently in men than in women. Of 18 cases of the simple or uncomplicated form of the disease, 12 occurred in males, and 6 in females; and in regard to the influence of age, the cases may be thus arranged—

Between	18	and	20	years,	1
"	20	"	30	"	2
"	30	"	40	"	7
"	40	"	50	"	3
"	50	"	60	"	5
					18

It would hence appear, that persons between 30 and 40 are more liable to cirrhosis. It is also met with in children; and M. Becquerel is disposed to think, that it occurs more frequently in young subjects than has been generally supposed.

Pathological Characters.—Pathologists do not agree as to the nature of the change of structure in cirrhosis. The disease consists essentially in the development of granulations of various sizes, both at the surface and in the very substance of the liver. These granulations may not be greater than shot of the largest size; but, at times, they are as big as cherries. The form of the liver is always more or less changed; commonly, it is much less than natural, and shrivelled as it were,—its tissue being denser than in the healthy condition. The granulations are of different colours,—red, brown, but more commonly yellow—and, at times, of a beautiful canary yellow. By the eminent pathologist, Laënnec, who first described this morbid state, these granulations were supposed to consist of a peculiar tissue, which, as it was developed, gave occasion to the absorption of the proper tissue. This tissue—Laënnec conceived—like some other accidental tissues, has two stages,—the crude and the softened. The views of Laënnec have not, however, been generally admitted. MM. Bouillaud and Andral, believing the liver to be formed of two distinct substances—the yellow and the red—are disposed to refer the lesion to an hypertrophied condition of the yellow substance,—the red becoming, at the same time, atrophied; hence the mammillated appearance which is presented by the yellow substance. M. Cruveilhier, on the other hand, does not admit, that the granules are formed of two distinct substances. His views of cirrhosis are,—that it consists essentially in atrophy of the greater number of granulations, and hypertrophy of the remainder to supply the deficiency thereby engendered. The two distinct substances in the liver,—the yellow, the secreting tissue,—and the red formed by the ramifications of veins and arteries—are, however, by no means generally admitted, and, until they are established, any theory founded upon them, cannot be implicitly received. The views of Mr. Kiernan in regard to the minute anatomy of the liver have given rise to another explanation, which is considered by Dr. Carpenter to be satisfactory. The small masses are regarded as uncongested patches, composed of parts of several adjoining lobules,

and having one or more interlobular spaces as a centre; and the biliary plexus of these, being filled with bile, gives them their yellow colour. In the other, there is a more or less complete atrophy of the portions of the substance of the liver intervening between them, so that the size of the liver is much diminished. This may be the true explanation; but the opinion of Laënnec has appeared to the author to be the most entitled to favour; and the circumstance that, in certain forms of cirrhosis, little granules having the appearance of adipocire can be washed out of their cellulo-fibrous capsules, after a maceration of some days in water, is greatly in favour of their adventitious formation. The matter of which the rounded masses in cirrhosis consists is not considered by Mr. Goodsir as a new deposit, but merely as the natural tissue of the liver, altered by the pressure exerted by their fibrous envelope. These alterations consist in constriction, more or less powerful, of the vessels and ducts which pass out of and into the rounded mass; the necessary difficulty with which the circulation is carried on, and the bile advanced along the ducts; and, later on, in a change in the constitution of the nucleated cells themselves, which, instead of being distended with bile containing oil-like globules, contains matter of a darker colour and less oil. The cells may at last contain matter perfectly black, and then the rounded mass assumes the appearance of a melanotic tubercle,—the black cells in some instances, becoming pyriform and caudate. Mr. Goodsir does not state the exact nature of these various changes in the liver, although he is inclined to believe, that the forms of cirrhosis and melanosis are due to the contractile tissue, as a product of inflammatory action more or less acute. His remarks on the whole subject can only be regarded in the light of suggestions. They are the foundation, however, of the view now embraced by many pathologists, that cirrhosis of the liver consists in a subacute or chronic inflammatory affection of the cellular tissue, which forms the capsule of Glisson, and which is intimately distributed through the organ, giving an investment to each acinus, and affording a bed for the ramifications of the vessels peculiar to the biliary apparatus. The consequence of this inflammation is—contraction; by which the glandular structure is irregularly displaced, and compressed according to the extent of the contraction, and the blood-vessels and biliary ducts are more or less obstructed. The secondary effects of the lesion are such as follow obstruction of the circulation through the liver, and of the biliary secretion,—as jaundice, ascites, &c.

The following case, which fell under the author's care, and was reported at length by a then resident physician of the Philadelphia Hospital, Dr. Edwin A. Anderson, of Wilmington, N. Carolina, will illustrate the general character of cases of cirrhosis. A woman, aged 65 years, was admitted into the hospital on the 31st of July, 1838. She had been in the habit of working in the open air, at gardening, and had been subject, for three years, to palpitation and severe attacks of dyspnœa, which continued for ten or fifteen minutes. She also had cough, attended with expectoration in the morning, and profuse sweating at night, for a long period. Her appetite was bad, and her habits

were very intemperate. A month previous to her entrance into the hospital, she had an attack of pleurisy of the left side, for which she was bled and purged. An attack of inflammation of the uterus supervened on the pleuritis, followed by extensive infiltration of the upper and lower extremities, and effusion into the thoracic and abdominal cavities. The effusion into the thorax was so extensive, that, according to the voluntary account of the patient, when she suddenly moved or rose from bed, she was sensible of a body of water rushing from one part of the chest to another. The day after her reception into the hospital, (Aug. 1,) she was labouring under excessive dyspnœa, which obliged her to assume a semi-recumbent posture; the lips were pallid; the skin was of a deep yellow hue, and the conjunctiva was of the same colour. There was extensive infiltration of the upper and lower extremities; the abdomen was distended, and presented very evident fluctuation; and the lower portions of both pleuræ were dull on percussion. Soon after her admission, she was attacked with delirium tremens, and sank under her complication of diseases on the 6th.

On examining the abdomen, the liver was found much enlarged, weighing about ten pounds; granulated, the surface raised into a number of round mammillated protuberances, of a tawny colour, closely resembling beeswax, none of them larger than a pin's head: the substance of these granulations was compact, and when divided, they presented a smooth, flat, even surface. The consistence of the liver was very firm, admitting the finger with much difficulty; semi-cartilaginous, and evidently greasing the scalpel when cut into. The whole organ presented an excellent example of cirrhosis combined with hypertrophy,—not with diminution of bulk, as defined by Laënnec. The gall-bladder contained a dark-coloured bile. The stomach presented, along its great curvature, a highly injected state of vessels; and the mucous membrane could be readily detached. These were the most marked appearances, and the most interesting in their application to the subject under consideration.

Cirrhosis never affects the liver partially; but attacks almost all its substance simultaneously.

VIII. MELANOSIS OF THE LIVER.

Synon. Melanosis hepatis; *Fr.* Mélanose du Foie; *Ger.* Melanose der Leber.

This affection is not common; yet many cases of it have been recorded; and it has been affirmed, that the liver and the lungs are the only organs in which melanotic tumours, of the encysted character, are liable to become softened, their contents to be discharged, and to leave after them excavations similar to those left by pulmonary tubercles. The opinions of pathologists have differed in regard to the modifications induced by it. Thus, it has been affirmed, that numerous and considerable melanotic tumours may exist in the organ, without inducing any unusual symptoms. On the other hand, anasarca, emaciation, and prostration have been ascribed to them. The condition is rather of pathological than of therapeutical interest, inasmuch as it cannot be diagnosticated during life.

IX. FATTY DISEASE OF THE LIVER.

Synon. Adiposis hepatica, Pimelosis hepatica, P. hepatis, Fatty liver, Adipous or Fatty degeneration of the liver, Adiposis of the liver; *Fr.* Dégénérescence graisseuse du Foie; *Ger.* Fettentartung der Leber, Fettleber, Fettsucht der Leber.

The liver, in a state of health, contains a certain quantity of fatty matter; and the cholesterin, which is secreted by it, is of the same character. It can be readily seen, therefore, that under certain modifications of the functions of nutrition of the liver, the quantity of fatty matter may become augmented, so that we may have a state of hypertrophy of the fatty substance, as we have of the cellular membrane. The portions of the liver that contain the fatty matter resemble in colour a dead leaf, figured irregularly with brownish or deep-orange spots. Internally, it has a somewhat corresponding appearance, excepting, that the brown and pale yellow tissues are much more uniformly distributed than upon the surface. Their consistence is diminished; and they give no evidence of the presence of the colouring matter of the blood. When they are cut into, the appearance of grease is evident on the scalpel; and, by boiling, the oily matter can be separated. This is, at times, small in quantity; but at others it would seem to occupy more space than the parenchyma of the organ. This was the case in a liver examined by M. Vauquelin. One hundred parts were found to consist—of oil, 45 parts; parenchyma, 19; water, 36. The oily matter has been examined by Dr. Golding Bird. It is a soft brownish substance, possessing a peculiar and disagreeable odour. A pound of the tissue of the liver has been found to yield about five drachms and a half, but—as before remarked—the quantity must vary according to the extent of the disease.

Sometimes, the fatty liver does not exceed the natural size: at others, it is greatly enlarged. It has been seen to extend beyond the brim of the pelvis; and, in one instance, to weigh 16 pounds. In all cases, it is of less specific gravity than healthy liver, the ratio, in two specimens, according to Dr. G. Bird, being as 1·027, to 1·062. In one case, cited by Dr. Mackintosh, large sections of the liver floated even in strong alcohol. At times, the depositions are partial, and are surrounded by sound hepatic parenchyma. Some of these have been found entirely composed of cholesterine.

In this as in other diseases of the liver, it is reasonable to expect that the bile should be a good deal altered in its properties. It is frequently of a dirty brown colour, and contains an infinite number of carbonaceous granules. The addition to it of most of the acids gives occasion to the exhalation of an intolerable odour. The urine, likewise, is commonly much changed; its specific gravity is less; it is neither acid nor alkaline, and holds numerous flakes of mucus in suspension.

Diagnosis.—There are no symptoms or signs which can be regarded as pathognomonic. Dr. Addison, has, indeed, affirmed, that he has found the disease associated with a remarkable appearance of the face,—dependent not so much on the expression of countenance, as on the texture and aspect of the integuments. The appearance, according to

him, is purely tegumental, and is not confined to the face, but may pervade the whole surface of the body, although he is disposed to think, that it is earliest observable, as well as most conspicous, in the integuments of the face and the back of the hands. The skin has the appearance of being bloodless, almost semitransparent, and waxy; and when this is associated with mere pallor, it is not very unlike polished ivory; but when combined with a more sallow tinge, as is now and then the case, it resembles more a common wax model. To the touch, the general integuments, for the most part, feel smooth, loose, and often flabby; whilst, in some well-marked cases, all their natural asperities would appear to be obliterated, and it becomes so smooth and soft, as to convey a sensation resembling that experienced on handling a piece of the softest satin. Whether this condition of the integuments precede or follow that of the liver; and whether the two be necessarily associated, in every instance, Dr. Addison is not prepared to offer a decided opinion. His observations ought to be borne in mind; although it would be singular were it a universal evidence of this lesion of the liver; and still more singular, if it were an evidence of this lesion only. A recent writer, Dr. Albers, considers the most important diagnostic to be,—great emaciation without dropsy:—and he affirms, that in hypertrophy, cirrhosis, and all other chronic diseases, dropsy always occurs both in the form of ascites and anasarca; but the generalization is evidently too comprehensive.

Causes.—The causes of adiposis of the liver are entirely unknown. It has been believed to be owing to irritation of the organ; but this view—as has been well observed by M. Andral—is mere hypothesis. Nor can we say more of the opinion—that it is owing to chronic inflammation with venous engorgement. We know, that adiposis takes place—not in the liver only, but in the adipous tissue in every part of the body, yet we should hardly be justified in referring obesity, occurring either spontaneously or artificially, to chronic inflammation with venous engorgement. The suggestion, that we might, with as much propriety, assign it to the nutrition of the liver having become less active, is good. We find, indeed, that in proportion as an organ—say a muscle—is exercised, its nutrition is augmented, and that the fat, deposited in the cellular tissue between its fasciculi, and surrounding it, is diminished in quantity, so that the outline of the organ is well pronounced; but if the muscle be kept in a state of inaction, its nutrition diminishes, whilst the secretion of fat becomes augmented. M. Andral, indeed, affirms, that it is a great law of the economy, that whenever an organ tends to atrophy, a fatty matter is deposited around it, or in the place of its molecules. Mr. Bowman has suggested, and Mr. Goodsir accords with him, that the fat in fatty liver is deposited within the nucleated cells of the organ, and that the disease is to be considered in fact as a redundancy of the oil globules naturally existing in these cells, with atrophy of the other structures. It is a striking fact, that the affection is most commonly observed in consumptive individuals. Of 123 cases of consumption, observed at La Charité in Paris, 44 had the lesion in question. It is met with, however, occasionally, when the lungs are not diseased. Of 49 cases, which occurred to M. Louis,

47 were in phthisical individuals. It has been hitherto witnessed more frequently in young than in old persons; and, according to M. Louis, in females oftener than in males. Of 65 cases, observed in the Royal Infirmary of Edinburgh, by Dr. Home, all but one occurred in women.

Treatment.—As there are no pathognomonic signs of the disease, no precise plan of treatment can be laid down.

X. CANCER OF THE LIVER.

Synon. Hepatoscirrhus, Scirrhus hepatis, Carcinoma of the liver, Encephalosis of the liver; *Fr.* Cancer du Foie, Hépatopathie cancéreuse ou Hépatosarcomie (*Piorry*); *Ger.* Krebs und Markschwamm der Leber, Leberkrebs.

Under this head may be considered *scirrhus*,—which, according to some, is a common affection, but according to Dr. Mackintosh is as rare as mortification,—and *encephalosis*.

Diagnosis.—There are no pathognomonic symptoms of this lesion. The same uneasiness may be experienced as in other chronic diseases of the liver; and, as in them, there may be no marked evidence of the existence of these malignant degenerations; or there may be jaundice, ascites, and anasarca. Where the morbid production is encephalosis, the countenance, it is affirmed by Dr. Marshall Hall, will be pallid, whilst if the disease be carcinoma, the countenance will be rather sallow, or straw-coloured, as in other cancerous diseases. Occasionally, the liver may be felt extending below the false ribs, and having on its surface irregular prominences, which may be painful on pressure. In encephalosis, the tumours are almost always much larger than in scirrhus. A case which fell under the care of Professor Hall, of the University of Maryland, and which the author saw both before and after dissolution, strikingly exhibits the slight disturbance, that may, for a time, attend these serious transformations. The case is reported at length in the North American Archives of Medical and Surgical Science, with some comments by the editor of the Journal, Professor Geddings, now of Charleston. A seaman was admitted into the Baltimore Infirmary on account of necrosis of the metatarsal bones. Professor Hall made an incision, with the view of removing the portion of bone affected with necrosis, but finding it adherent he desisted. The patient became very much oppressed during the operation, and was seized, on the following day, with alarming irritability of stomach, and incessant vomiting and purging. There was no pain or tenderness on pressing the epigastric or hypochondriac region, nor any symptom indicative of inflammation of the gastro-intestinal surface, unless the vomiting and purging are regarded as such. The pulse was feeble, undulating, and indistinct, and did not exceed forty-five beats in the minute. The tongue was red on the margins, and coated with a dark fur in the middle. The evacuations were dark, watery, and fetid. On the third day, universal jaundice supervened, without any marked change in the other symptoms. From this time, the emaciation and debility went on increasing for a month, at the expiration of which time the patient died, without experiencing any pain in the region of the biliary apparatus. On laying open the cavity of the abdomen, the

liver was found to be greatly diseased. It was increased in size, hard, exceedingly uneven on its surface, and of a dirty grayish-brown hue. The stomach presented no marked evidences of disease. In the duodenum, there was a large indurated mass, intimately incorporated with the head of the pancreas, which was much increased in size, and exceedingly hard, and uneven on its surface. On laying open the diseased portion of the duodenum, it was found to be extensively involved in encephaloid degeneration, which formed a thick mass surrounding the whole intestine, and involving the contiguous portion of the pancreas. This mass was extensively ulcerated on the intestinal surface. The common choledoch duct was so much obstructed as to render it almost impervious; and, in consequence, the gall-bladder was enormously distended, and its neck, with the cystic duct, so much dilated as to form a continuous tube from the gall-bladder as large as the finger. The whole excretory apparatus of the liver was equally distended. The common choledoch duct was of the size of the middle finger; and, on tracing it up towards the transverse fissure of the liver, the hepatic duct, and the two branches that form it, were found in the same condition. At the point, at which the latter emerge from the gland, they were large enough to receive the tip of the middle finger. They were distended with a greenish-coloured mucous fluid, which flowed out in great abundance when the liver was sliced; and, before the real condition of the ducts was discovered, led to the supposition that it proceeded from numerous cysts in the substance of the gland. The coats of the excretory ducts were much thickened throughout their entire extent. The gall-bladder contained, in addition to the large quantity of fluid by which it was distended, a number of small dark-coloured biliary calculi; and several of the same kind were lodged in the common choledoch duct, where they tended to augment the obstruction occasioned by the encephaloid tumour of the duodenum. The most interesting morbid appearance was the complete occlusion of the trunk of the vena porta, and its primary bifurcations, by encephaloid matter. The trunk of this vessel, for some distance from the liver, was completely plugged up; and on laying open its left and right branches, the same obstruction was found to exist in the former, nearly as far as the point at which it branches out into the left lobe; whilst, in the latter, it extended even farther—several of the subdivisions of the vessel, within the substance of the right lobe, being closed up by the same material. In one portion of the trunk of the vein, it seemed to be slightly attached to the inner surface of the vessel by means of an exceedingly delicate false membrane of a red colour; but no adhesion was discovered at any other point. The hepatic artery was in a healthy condition, and did not seem to be increased in size.

In this case, the encephalosis implicated the excretory ducts more than it did the parenchyma of the liver; but it is singular, that such extensive disease could have existed with so little local uneasiness.

Causes.—Besides the causes of cancer in general, it has been affirmed, that blows on the region of the liver, intemperance in diet, the

abuse of purgatives, &c., are circumstances that favour its production: in all cases, however, the cancerous diathesis must be present.

Pathological Characters.—The liver may be found studded with tumours, varying in size from that of a pea to that of the fist. These are yellow, opaque, hard; and commonly, when cut into, present fibrous radii converging towards the centre of the tumours; but, at other times, forming concentric circles. Usually, they present no trace of organization. Their texture is firm, and they cry, as it were, under the scalpel. At times, they are softened towards the centre, and contain a fluid like lees of wine,—the tissue surrounding them, both when of this nature and when encephaloid, being healthy. Commonly, the scirrhous tumours are smaller than the encephaloid; the latter, indeed, may be as large as the fist, or of the fœtus at the full period. The tissue, which forms the basis of the scirrhous tumour, is dense and fibrous; that of the encephaloid tumour is cellular and loose. The progress of the former is generally slow; of the latter, much more rapid.

It often happens, that these morbid appearances are not met with alone, and that the carcinomatous and tubercular degenerations exist in different stages of their progress.

Treatment.—If the symptoms be so obscure as to lead to no satisfactory diagnosis, the treatment must be unsatisfactory likewise. Should the lesion be suspected, it must be treated on the same principles as cancerous disease of other organs.

XI. TUBERCLES OF THE LIVER.

Synon. Tubercula hepatis; *Fr.* Tubercules du foie, Hépatopathie tuberculeuse ou Hépatostrumosie, (*Piorry*); *Ger.* Lebertuberkeln, Tuberkeln der Leber.

These are, by no means, of common occurrence. Even when they are present in the lungs, the liver is so rarely affected by them, that distinguished observers have never met with them, whilst others have only found them rarely. Of 123 cases of pulmonary consumption, noted by M. Louis, there were but two that exhibited tubercles in the liver. Yet, by Professor Gross, of Louisville, they are said to be of very common occurrence. It is probable, however, that this is an accidental error, as in the next page he remarks, that, on the whole, he is induced to believe, that the lesion of the liver is rare in this country. M. Rostan affirms, that true tubercles of the liver are more rare than cancer of the organ. The tuberculous matter itself undergoes no changes, except that it is occasionally coloured by the bile, and this bilious coloration in the midst of tubercular masses, has been met with in the fœtus.

Tubercles of the liver give rise to no symptoms, which can be esteemed diagnostic of their presence.

XII. CYSTS IN THE LIVER.

Synon. *Fr.* Kystes du Foie.

Cysts in the liver containing watery fluid, are not uncommon. They are usually confined under the peritoneal coat, and may appear either upon the convex or concave surface of the organ. It has been

a matter of question how they form. Doubtless, there is some organic change, in the first instance, in the capillaries of the viscus, which gives occasion to the effusion of plastic lymph, or to some obstruction in those vessels. This becomes a source of irritation, and when we reflect upon the rapidity with which cysts are formed, even in the case of the most acute and rapid abscesses, we can have some idea of the reason why they form so readily in the liver.

The following is one of the most remarkable cases of extensive serous cysts of the liver on record. It is given by Dr. Abercrombie. A man, aged 32, was affected with an immense tumour of the abdomen, which filled the greater part of it, extending from the region of the liver considerably below the umbilicus, and into the left side. At the upper part, near the ribs, on the right side, there was an evident fluctuation. This was most remarkable, when the patient was erect: in the horizontal posture, it seemed as if the fluid retired under the ribs. No fluctuation was perceived in any other part of the mass. The breathing was much oppressed and laborious, especially on any attempt to turn on the left side, when the patient seemed in danger of instant suffocation,—gasping, for several minutes, in the utmost agony, before he recovered his breath. He was much emaciated, and the affection was of about a year's standing. A puncture was made in the spot where fluctuation was felt; and a clear serous fluid drawn off, to the amount of nine or ten pounds. The opening continued to discharge freely for several days. He was much relieved by the operation, but his strength continued to fail, and he died about ten days after it.

On inspection after death, the liver appeared very little enlarged. The tumour was found to consist of an immense sac, formed on the convex surface of the viscus, under the peritoneal coat; it was of such a size as—on the one hand—to press down the liver below the umbilicus; and, on the other, to force the diaphragm upwards as high as the second rib. The right lung was compressed into a small flaccid substance less than a kidney; the left was also much diminished in size; and the heart was as small as that of a child of five or six years of age. This immense cyst adhered firmly to the posterior half of the diaphragm; but, betwixt it and the anterior part of the diaphragm, there was a distinct cyst, containing a watery fluid. This last had been opened by the operation. The great cyst was entire, and contained 18 pounds of transparent colourless fluid. Its parietes were firm and dense, like peritoneum very much thickened. In the bottom of the cyst, were found two singular bodies, consisting of flat cakes of a soft gelatinous matter rolled up into solid cylinders; when unrolled, they were about ten inches in diameter, and about one-eighth of an inch in thickness, and had the appearance of a deposition, which had been separated from the inner surface of the cyst. The liver was not diseased in its structure, and the other viscera of the abdomen were healthy, but remarkably displaced,—the stomach being on the left side and the pylorus towards the left os ilii.

One of the singular circumstances of this case was—the uncommon firmness of the tumour, which gave occasion to the belief, that an im-

mense mass of organic disease existed, without fluctuation, except at the part which was opened.

A similar case to the above is said to have occurred in the Infirmary of Edinburgh many years ago, under the care of the late Dr. Gregory. The tumour was supposed to be an immense enlargement of the liver; but the whole hardness suddenly disappeared, with a sensation to the patient as if something had burst internally. Fluctuation then became evident, although none had been perceived before. The patient died on the following day; and, on dissection, it was found, that this remarkable change had been owing to the cyst having burst into the cavity of the peritoneum. Cases of an analogous nature have been recorded by other observers.

XIII. HYDATIDS IN THE LIVER.

Synon. *Fr.* Hydatides du Foie; *Ger.* Hydatidöse Entartung der Leber.

There is no organ in the body in which hydatids are so frequently found, as in the liver. Generally, it is the "multiple acephalocyst," (*A. socialis* seu *prolifera*,) which is met with. At times, however, it is the "solitary acephalocyst," (*A. eremita* vel *sterilis*.) A rare species of hydatid—*Echinococcus hominis, E. hepatis;* Ger. *Acephalocystenbalg der Leber*, has also been found in the liver by Mr. Curling.

Although the author has placed these collections under the head of hydatids, he is doubtful whether they ought not to have been considered under that of serous cysts, to which, he thinks, they belong. The more he examines into their nature, the more satisfied is he, that they are not animals, but ought rather to be esteemed diseased products, not necessarily, however, the result of inflammation,—a view which, by the way, has been stigmatized by M. Rostan, as "sinking of itself before the simple lights of common sense, and not needing refutation."

The most common seat of hydatids is in the right lobe; and these are often contained in the interior of a large cyst, or *maternal hydatid* —as it has been termed. Occasionally, more than a thousand have been counted. Their size is various. Sometimes, they are not larger than a millet-seed, whilst at others, they are as large as the fist. The liquid, in which they swim, is rarely limpid. It is of a yellowish hue, and its quantity is, at times, considerable. A case is recorded by M. Bianchi, in which twenty quarts of fluid were discharged from a swelling of this kind. The fluid consisted of serum and a thick jelly, which was regarded as the *detritus* of an acephalocyst. Mr. Annesley has referred to a case in which a cyst was attached to the concave surface of the liver, which contained a quart of watery fluid, having an hydatid floating in it.

Hydatids—like serous cysts in general—are found inclosed in a large cyst, which may be of considerable thickness, and composed of fibrous layers in superposition, which are often incrusted with phosphate of lime in irregular patches. Like those cysts, too, they may experience various alterations, so as to be taken for steatoma, atheroma, meliceris, and even for softened tubercles. The author has occasionally met with tumours resembling scirrhus, some of which have contained blad-

ders filled with a thin watery fluid: others have been seen containing a fatty matter, and others, again, a sandy substance.

Diagnosis.—As these cysts become very slowly developed, they do not give rise, in the first instance, to any symptoms that indicate their presence in the liver. It is only when they become so large as to interfere with the functions of that viscus, that any suspicion can be entertained of their existence; and even then there are no symptoms of their presence distinct from those of other chronic affections of the organ. Commonly, the digestive functions are disturbed; the hypochondrium is swollen; the false ribs are raised up, and fluctuation is, at times, perceptible.

With regard to the termination of these hydatid formations;—if they attain the biliary passages, they may pass into the duodenum, and be discharged by the bowels; or if any adhesion occur between the cyst and the intestines, they may be discharged in the same manner. In such case, their existence admits of detection. Again, they may be discharged into the cavity of the peritoneum, and occasion fatal peritonitis. In a case, which occurred in the Middlesex Hospital, a cyst in the liver, containing hydatids, burst into the lungs; and, for a long period, hydatids continued to be expectorated along with a yellowish mucus. All doubts as to the real nature of the case were removed by the necroscopy.

Treatment.—Where the presence of serous cysts in the liver is decidedly proved by the existence of fluctuation, it has been advised—from the success obtained by evacuating purulent collections in that organ—to adopt the course of evacuating them artificially. Cases, indeed, would seem to have occurred, where their spontaneous rupture through the parietes of the abdomen has eventuated favourably. The operation has, accordingly, been practised; and five well-authenticated cases of a successful result have been published by M. Récamier. This gentleman first introduces a capillary trocar, by way of exploration; and applies over the canula a cupping glass, which draws out the limpid fluid of the cyst, if such there be. He now applies caustic potassa, and as the eschar separates, he applies it again and again, with a view of causing inflammation in the peritoneum, and exciting adhesion between it and the peritoneal coat of the liver, or the parietes of the cyst. Gradually the parietes of the cyst are destroyed, and in this way the fluid is evacuated. To prevent the access of air, which is regarded as a deleterious agency, in cases of a spontaneous rupture, the interior of the cyst is injected, and kept constantly filled with a liquid, which is at first emollient, and, later on, made slightly irritating and antiseptic. The progressive diminution in the quantity of fluid required to fill the cyst is a measure of the gradual approximation of its walls.—Another method is, to make an incision, about two or three inches long, in the skin, over the most prominent part of the tumour; the muscular layers are then successively divided, until the peritoneum is exposed, which the surgeon elevates with the dissecting forceps, and cautiously opens. If the omentum or intestine present, it is gently pushed back, and, by the aid of a director, the incision into the peritoneum is made as large as may

be esteemed advisable. The tumour presents itself at the bottom of the wound, which is now dressed, and the patient is placed on the same regimen as after serious operations. Two or three days afterwards, the dressing is removed; the peritoneum is found inflamed, and the cyst has contracted adhesions with the margins of the wound. The scalpel is now passed into it, the liquid evacuated, and a tent of lint introduced into the opening. It need scarcely be said, that these operations require much cautious reflection, and that they must always be extremely hazardous, and liable to uncertainty in the results.

XIV. WORMS IN THE LIVER.

The liver of the human subject has been found to contain an entozoon, which, however, is more common in animals,—as the sheep, goat, ox, stag, fallow-deer, horse, ass, hog, and hare. In sheep, affected with the rot, the organ is sometimes filled with them. This entozoon is the *distoma hepaticum* or *fluke;* Ger. *Leberegel*, which has been already referred to, (p. 189.) It is somewhat lance-shaped, with both extremities obtuse, having two orbicular openings,—one in front, which is directed obliquely inwards, and another behind and inferiorly, which is slightly prominent, and answers to the anus. The young worm, generally seen, is of a variegated brownish-white colour; the adult, of a dirty yellowish, greenish, or brownish hue. These worms have been said to exist in the branches of the vena porta, as well as in the pori biliarii. It has been denied, that they are ever seen in the former, but the evidence is too strong to be set aside. There can be no doubt, however, that they are more frequently met with in the biliary ducts, where their presence—especially in animals—is found to have produced much thickening of their coats. This has been ascribed, however, to induration of the mucous secretions. In a liver, thus circumstanced, the organ is unequal in its surface, and if the projecting parts be pressed upon, a crepitation is heard, which proceeds from the bruising of small osseous laminæ. These incrustations are, at times, so extensive, that, on dissection, small bony tubes can be obtained. In such case, the entozoa generally die. Occasionally, other entozoa crawl from the small intestines into the common choledoch duct, and ascend even as far as the gall-bladder. Such is the case with the ascarides lumbricoides, the presence of which may excite much irritation and profuse suppuration. In a case, recorded by Dr. Thomas Bond, of Philadelphia, a large abscess was found in the substance of the liver, which contained nearly two quarts of bloody matter, with a worm nearly two feet long by an inch in diameter. It is impossible, however, to form any accurate judgment of the species of the worm from the description.

On examining the liver of a rat, Professor Gross found a serous cyst, about the size of a marble, on the under surface of the organ, which contained a tænia one foot in length, by two lines in breadth. It was completely coiled up, and lived for upwards of an hour after its removal.

When the presence of entozoa in the liver is suspected, the ver-

minous diathesis must be remedied by the agents described elsewhere (p. 194).

XV. HEMORRHAGE OF THE LIVER.

Synon. Hæmorrhagia hepatis, Apoplexia hepatica; *Fr.* Hémorrhagie du Foie, Hemorrahagie hépatique, Apoplexie hépatique, Hépatorrhagie, Hémo-hépatorrhagie (*Piorry*); *Ger.* Blutfluss der Leber, Leberblutfluss.

Hemorrhage of the liver is by no means a common occurrence. It can rarely happen, that the engorgement of vessels is such as to give rise to rupture of their coats, and consequent effusion of blood into the organ. It has been maintained, indeed, by M. Cruveilhier, that the affection is more common than is generally thought; and that the structure of the parenchyma of the liver, and the great number of vessels predispose to it. It is a fact, however, that the lesion is rarely met with on dissection; and, in opposition to the views of M. Cruveilhier, the belief has been expressed, by M. Heyfelder, that the very richness of the organ in vessels, as well as the softness of its parenchyma, is adapted to prevent rupture of vessels, and effusions similar to those that take place in the brain and lungs.

When effusion of blood does occur, it may either form a cavity in the organ, or the parenchyma may be torn, and the fluid be effused into the cavity of the peritoneum; or it may make its way into the biliary ducts, attain the duodenum, and be evacuated by vomiting or *per anum*. The disease cannot be diagnosticated during life; should, however, the liver exhibit sudden evidences of great augmentation of size; and deep-seated fluctuation be, at the same time, observable; and should symptoms of internal hemorrhage supervene; and especially if, after evidences of great hyperæmia, hemorrhage should suddenly take place from the stomach and bowels, with diminution of the hepatic hyperæmia, the existence of hemorrhage of the liver may be suspected; but unless these signs are co-existent, it is obviously impossible even to suspect the origin of the hemorrhage, as we have no means of distinguishing, whether the blood proceed from the biliary apparatus, or from the mucous membrane of the stomach and bowels.

XVI. NEURALGIA OF THE LIVER.

Synon. Neuralgia hepatis, Hepatalgia, Colica hepatica; *Fr.* Névralgie du Foie; *Ger.* Leberschmerz, Leberkolik.

The nerves of the liver—like those of other organs—are liable to morbid conditions, independently of inflammation. Neuralgia may likewise accompany neuropathic affections seated elsewhere.

Diagnosis.—This is by no means easy. The pain may readily be confounded with that arising from the passage of a gall-stone. Where, too, distinct evidences of chronic inflammation of the liver have existed, and, under the influence of appropriate treatment, the signs of inflammation and organic derangement have subsided, but severe pain continues in the region of the liver, the nature of the pain is often mistaken; it is supposed to depend upon a continuance of the inflammatory action, when it is nothing more than a neuralgic affection,—a remnant or successor of the former disease, and to which the antiphlo-

gistic treatment may be wholly inapplicable. "Under such circumstances"—says Dr. Stokes—"the patient goes from one practitioner to another, taking different medicines and submitting to repetitions of the usual modes of treatment, with but little or no benefit. Now, I have seen in several cases, this symptom yield completely to treatment calculated to remove purely neuralgic affections. In a case lately under my care of a gentleman who had been attacked with enteritis and hepatitis in India, and who had taken enormous doses of calomel 'for the liver,' and of croton oil 'for the bowels,' this circumstance occurred. When first I saw him, he was emaciated, the skin yellow, the urine high-coloured, with thirst, costive bowels, and great tumefaction in the region of the liver. These symptoms completely subsided under treatment, but a violent pain, recurring at intervals, continued obstinate. This was rapidly removed by a course of the carbonate of iron, and the use of the belladonna plaster."

The seat of the disease is presumed by pathologists to be the hepatic plexus, the morbid condition of which is conveyed to the great nervous centres. It occurs in the nervous, and the hysterical; and is said, by Dr. Stokes, to be not unusual. During the height of the exacerbations, the pain, as in other forms of neuralgia, is commonly most excruciating, but, at times, it is less severe. It may be continuous, but, more usually, it is intermittent, and there may, or may not, be sensibility on pressing the region of the liver. There is not, however, any tumefaction. It is a mistake to say with some, as M. Andral, that there is no sensibility on pressure in hepatalgia. The author has elsewhere remarked, that pain may exist, with great sensibility on pressure, in an organ, and yet there may be no inflammation; and, on the other hand, the circumstance of excruciating pain, with exquisite tenderness in the region of the liver, furnishes—as has been well observed by Dr. Stokes—a sort of key to diagnosis; for along with it we have, in hepatalgia, the skin cool, the pulse tranquil, no fever, no permanent derangement of the bowels, and no tumefaction of the liver. If the disease, too, have been of long standing in a person of nervous habit, and have resisted bleeding, mercury, and counter-irritation, or have been caused by those agents, the diagnosis may be considered established.

Treatment.—This, it need scarcely be said, is the same as in neuralgia in general. Certainly, powerful antiphlogistic measures, which would be so serviceable in acute hepatitis, can scarcely fail to do mischief here. The very subjects, in whom it is generally seen, would at once contra-indicate the employment of such measures. Some of the most deplorable cases, that have been witnessed, have occurred in those, in whom neuralgia of the liver had been mistaken for hepatic inflammation, and the patient subjected to such modes of treatment as gave the constitution a shock from which it never recovered. The treatment that promises most success is the use of the subcarbonate of iron in large doses, and relieving the violence of the pain, during the exacerbations, by mustard plasters, and anodynes, given both by the mouth and rectum. In the intervals, the emplastrum

belladonnæ of the pharmacopœias may be worn. The following form has been advised, but it does not seem preferable to the officinal.

Take of extract of belladonna, three parts; of gum ammoniac and soap plaster, each one part. Spread these on a piece of leather with an adhesive margin, and make the patient wear it over the region of the liver.

XVII. INFLAMMATION OF THE GALL-BLADDER.

Synon. Inflammatio vesicæ felleæ, I. Cystidis felleæ, Cystitis fellea, Cholecystitis; *Fr.* Inflammation de la Vésicule du Fiel, Cholicystite, (*Piorry*,) Cystite biliaire; *Ger.* Gallenblasenentzündung, Entzündung der Gallenblase.

This disease is not common as an idiopathic affection. It is a concomitant, however, of other diseases of the liver, especially in India, and particularly of biliary calculi.

Diagnosis.—The ordinary symptoms are said to be;—sudden, acute, and, at times, excruciating pain at the margin of the false ribs, increased by pressure, by inspiration, and the horizontal posture on the back. The patient can scarcely straighten himself, and commonly lies on the left side, with his lower limbs drawn up. The paroxysm of pain continues for some hours, when it diminishes; and commonly, as it diminishes, jaundice appears. At the same time, the digestive functions are more or less disordered, and vomiting is a usual attendant. Along with these local symptoms, are those of general fever, which, it is asserted, by M. Andral, is accompanied by a small, contracted pulse, great thirst, but without shivering or much heat of skin. It is obvious, however, that there must be variety in the last-mentioned phenomena. Constipation exists, and the urine resembles that of jaundice. The disease may prove fatal from the intensity of the inflammation, or the gall-bladder may become perforated, and its contents pass into the cavity of the peritoneum,—a result which is announced by the supervention of sudden and fatal peritonitis, and which has to be dreaded in all cases of inflammation of the gall-bladder. The inflammation may become chronic, and extensive suppuration form. In such cases a globular tumour of greater or less size may be detected on careful examination beneath the margin of the ribs on the right side, which may exhibit distinct fluctuation.

The common choledoch duct, like the gall-bladder, may be inflamed, constituting the *cholédocite* of M. Piorry, and the lesion may occur in both situations, simultaneously or consecutively. It may be suspected, when icterus supervenes on inflammation of the duodenum, along with symptoms indicating distension of the gall-bladder and hepatic disorder.

It has been affirmed by Mr. Twining, that small tumours are occasionally developed in the capsule of Glisson, which may be the cause of obstruction to the bile in its passage to the duodenum. Two small bodies—it is stated—are always to be found, on careful dissection, which appear to be absorbent glands or ganglions. One of them is situate near the termination of the gall-bladder, in the cystic duct,—the other at the upper part of the ductus communis choledochus; and Mr. Twining affirms, that enlargement of these bodies, with inflammatory excitement about the capsule of Glisson, may cause closure of the biliary ducts. He has, at least, found the ducts ob-

literated exactly at the point where these enlarged glands were causing pressure.

Causes.—Inflammation of the gall-bladder may be idiopathic, or it may supervene on inflammation of the stomach and duodenum. It has been supposed, indeed, to be always secondary or symptomatic. It may be caused by the presence of extraneous bodies, as of worms or calculi, in the gall-bladder, and it more frequently acknowledges the last cause than any other. It may be produced, also, by blows over the right hypochondrium.

Pathological Characters.—On dissection, the gall-bladder, and the ducts—if they have been inflamed likewise—will exhibit manifest signs of inflammation. It may have terminated in suppuration, in which case the quantity of matter may be very great. In one case, described by Dr. James Johnson, it contained a pint of thick purulent secretion, mixed with a great number of calculi. The cystic duct was wholly obliterated, and the parietes of the gall-bladder, which had contracted extensive adhesions to adjacent organs, were much thickened and ulcerated in places. In another case, recently recorded by Dr. B. G. Babington, the gall-bladder appeared to have contained three washhand-basinfuls of a purulent fluid. The cause of the obstruction in this case was not discoverable. In other cases, evidences of perforation, are met with.

Morbid changes in the gall-bladder are very common amongst the residents in India. Two opposite conditions as to size are seen, which are supposed to depend upon the length of time the patient has resided in the East. 1. The gall-bladder is increased in size and distended with bile, by the pressure of which the sulcus in the right lobe of the liver, that lodges the gall-bladder, becomes enlarged and deep. This state is said to have been commonly found on the examination of the bodies of those who had recently arrived in India. 2. The gall-bladder is of less size than natural, and not in proportion to the sulcus in which it is lodged, and in many of these cases, a false membrane is found covering it, and sometimes uniting it to the adjacent parts. This morbid condition is said, by Mr. Twining, to be observed in the bodies of those who have been long resident in India.

Frequent repletion and habitual over-excitement of the gall-bladder, and irritation of parts in its vicinity, with a disordered condition of the upper portion of the intestinal canal, are said to give rise to transient and circumscribed inflammation, which is often followed by a deposition of coagulable lymph, that covers the gall-bladder; and a similar exudation sometimes occurs in the cellular structure of the capsule of Glisson. This lymph, which in many cases unites the fundus of the gall-bladder to the adjacent portion of the colon, soon becomes organized, and, like other newly formed parts of a similar nature, is subject to absorption and shrinking, so that the gall-bladder, which had been previously enlarged by frequent over-distension, becomes ultimately contracted. These are, of course, the results of chronic and repeated inflammation, between which and the acute forms all intermediate degrees are met with.

Treatment.—This must be decidedly antiphlogistic. As, however, it

it is not easy to distinguish inflammation of the gall-bladder from circumscribed inflammation of the liver, the treatment will usually have to be regulated by the rules laid down under the latter affection; the extent to which the antiphlogistic regimen should be carried being regulated by the degree and duration of the inflammation.

XVIII. DISTENSION OF THE GALL-BLADDER.

Synon. Turgescentia vesiculæ felleæ, Hydrops vesicæ felleæ, Cystocele biliosa, Ascites hepato-cysticus, Physconia biliosa, Hepatalgia Petitiana; *Fr.* Hydropisie de la Vésicule du Fiel, Distension de la Vésicule du Fiel, Cholicystiectasie (*Piorry*); *Ger.* Gallenblasenwassersucht.

The biliary ducts are liable to the same kind of pathological conditions as the gall-bladder; and if any obstructing cause exist in them to the discharge of the bile, great distension of the gall-bladder may be the consequence. In such case, the fluid may consist merely of bile; but, in other cases, it is a mixed secretion, and occasionally so thin and aqueous as to have given to the affection the name of *Dropsy of the gall-bladder.* This term has not, however, been restricted to accumulation of fluid in the gall-bladder, but has been applied, also, to cases in which the submucous cellular tissue of the gall-bladder has been infiltrated with serous fluid,—an affection which might be termed *Œdema of the gall-bladder,* and,—as has been remarked by M. Andral,—belongs rather to the domain of pathological anatomy than of pathology.

Diagnosis.—When the gall-bladder undergoes distension, owing to occlusion of the cystic duct, the symptoms, at first, are not such as to direct attention to the real pathological condition. More or less pain is felt in the region of the gall-bladder, which may be constant or intermittent; and, if the former, is liable to exacerbations. It varies, likewise, in intensity, according to the suddenness or more protracted nature of the affection. When these symptoms have persisted for some time, a tumour is perceived in the right hypochondrium, beneath the margin of the false ribs, which gradually increases,—at times, in the direction of the epigastrium,—at others, in that of the iliac region. This tumour may be felt to contain fluid. Where the cystic duct is alone obstructed, the condition may exist for a long time, so that the patient may be able to attend to his business without experiencing any great derangement of health. In other cases, however, the gall-bladder, or the duct or ducts above the seat of the obstruction, become perforated, and death occurs from peritonitis. The diagnosis of these cases requires great attention. The difficulty lies in distinguishing them from abscess of the liver, as remarked under Hepatitis. Mistakes of this kind have, indeed, been made; and, under the supposition that the tumour was an hepatic abscess, an opening has been made into it, bile has been discharged instead of pus, and by getting into the cavity of the peritoneum, it has caused fatal peritonitis. A case has been detailed by Mr. Howship, in which the termination was more fortunate. A patient, who had suffered under hepatic disease in India, was admitted into St. George's Hospital, London, with a tumour beneath the cartilages of the right ribs, attended with pale stools, and a bilious tinge of the skin. Fomentations were applied. A central

softness induced Mr. Heaviside to puncture it, and about two ounces of a thin purulent bilious secretion flowed daily. In three months, the discharge became scanty and purulent, and the opening contracted and healed,—the stools reassuming their healthy colour, and the patient his feelings of perfect health.

Mr. Howship has given the particulars of a case, in which there was reason to believe, that *permanent spasm of the gall ducts* had occasioned death. He took the ducts, placed them on a piece of glass in a cool place, laid them aside, and examined them six hours afterwards, when he found, that air from a common blowpipe passed through a portion of the duct, which he had at first thought to be obliterated, "and when further dissected for putting up to demonstrate the contraction, it had become as perfectly relaxed as any other part of the tube."

Abscess of the liver—it must be borne in mind—is generally attended by symptoms of inflammation, whilst distension of the gall-bladder may not always present any corresponding train of phenomena. Such is the view of Dr. Stokes; but the exceptions must be numerous. He considers, therefore, the first part of the diagnosis to consist in "the occurrence of a tumour in the hypochondriac region not preceded or accompanied by any of the symptoms which characterize hepatic inflammation." Again, in abscess of the liver, we have first induration and tumefaction, and then evidences of fluctuation, whilst, in cases of distension of the gall-bladder, the tumour is soft and fluctuating from the commencement; the patient is generally jaundiced, and there is no accompanying hectic. In severe cases, it is affirmed, that the whole of the liver may be filled with bile, and communicate a distinct fluctuating feel, owing to the engorgement of the ducts, which are filled with that fluid. The average quantity of bile found in the gall-bladder after death has been estimated by Dr. Wm. Saunders, at one ounce; but this is probably too high. One half the quantity is perhaps nearer the truth. Dr. Babington has recorded an example of enormously distended gall-bladder, the cyst containing at least three washhand-basinfuls of fluid.

Pathological Characters.—On dissection, the cause that has given rise to the dilatation of the gall-bladder will be apparent. At times, it is the result of an inflammatory process; but, most commonly, it is owing to a calculus impacted in the ducts. At other times, again, scirrhous induration of the duodenum or pancreas may prevent the flow of bile into the intestine; and, under such circumstances—as in the case described under another head—the biliary ducts may be largely distended even as far as their terminal extremities. In some cases, the gall-bladder has been found enormously distended,—as large even as the urinary bladder. The fluid contained in the reservoir is not always alike. It may be bile but little altered in its characters; or it may be watery and without any bitterness: sometimes it is like jelly, and at others, resembles albumen or synovia, and even urine.

Treatment.—It is impossible to have recourse to any plan of treatment which can remedy the evil. It must be altogether palliative, and adapted to the removal of coexistent symptoms. Puncturing the

tumour can scarcely be said to be the only resource, inasmuch as it can rarely, if ever, be proper.

The gall-bladder is liable to other morbid alterations, which are more interesting as questions of pathological anatomy than of pathology. Of these, *ossification* is one. There are many cases on record, in which the reservoir has become almost wholly converted into bone, and others, in which the gall ducts, and especially the ductus communis choledochus, have undergone this conversion. These lesions cannot be diagnosticated during life.

Occasionally, too, *atrophy* of the gall-bladder and its ducts is observed,—the cavity becoming progressively less, and the parietes converted into a small solid fibrous mass. Cases, too, are on record, in which the gall-bladder has been altogether wanting,—at times, as the result of a morbid process; at others, as a congenital defect: a fact, which shows, that the reservoir is not indispensable to the execution of the digestive or other functions. There are no symptoms, which can be regarded as pathognomonic of these lesions.

Of *obliteration and obstruction of the biliary ducts* mention has already been made. The subject is also intimately connected with those of gall-stones and of jaundice, which will next engage attention.

Cancer of the gall-bladder and *ductus communis choledochus* is met with at times, without the liver participating; or those parts may become affected secondarily. In most of these cases, the symptoms have been,—jaundice, with a tumour in the right hypochondrium, and more or less disorder of the stomach and bowels.

XIX. BILIARY CALCULI.

Synon. Calculi fellei seu biliarii, Gall stones; *Fr.* Calculs biliaires, Pierres au Fiel; *Ger.* Gallensteine, Lebersteine.

The formation of gall-stones in the gall-bladder is by no means of uncommon occurrence; and, frequently, they are found on the dissection of those who have given no reason to suspect their existence. In these cases, they have formed gradually in the gall-bladder, and have remained there; but when they leave that reservoir, and pass along the ducts, the irritation excited by them in the biliary passages is so great, that its source can scarcely be mistaken. These two conditions have given rise to the distinction between the *chololithus quiescens*, and the *chololithus means*,—the "quiescent, and the passing gall-stone" of Dr. Good. To the pathological state, that gives occasion to their formation, and characterizes their presence, the names—*Chololithus, Cholelithus, Cholelithia, Cholelithiasis, Lithiasis hepatica;* Ger. *Gallensteinkrankheit, Steinerzeugungssucht in der Gallenblase*—have been given.

Diagnosis.—The presence of calculi of recent formation, in the gall-bladder, may give rise to no uneasiness whatever; or pain may be felt in the epigastric region towards the right side, shooting through to the back, with more or less disorder of the stomach and first passages; and, at the same time, a yellowish hue may be perceptible. These may be all the uneasy feelings experienced even when the gall-stones may be so large, or so numerous, as to form a prominence beneath the

cartilages of the ribs, so as to permit the calculi to be detected by palpation in thin subjects. When, however, a calculus begins to move along the ducts, the symptoms are much more marked. Then commences the aggregate of phenomena, which have been termed *hepatic colic, Colica hepatica, Hepatalgia calculosa;* Fr. *Colique hépatique;* Ger. *Leberkolik.* The patient is attacked, more or less suddenly, with excruciating pain in the epigastrium and right hypochondrium; and, along with this, with nausea and vomiting. The abdominal muscles are thrown into spasmodic contractions, the extremities are cold, the body bathed in perspiration, and the pulse generally unaffected. The sudden attack of most excruciating pain, whilst the pulse is not more excited than natural, has, indeed, been esteemed, diagnostic of this affection. The suffering is sometimes so great, that the author has seen strong individuals writhing on the floor in the utmost agony. At times, this condition is followed by jaundice, but the latter is by no means a universal sequence. It has, however, been affirmed by Dr. Stokes, that if the gall-stone becomes impacted in the duct, jaundice is sure to follow. Should it be in the cystic duct, the urine may be of the natural colour, and the fæces with the usual proportion of bile; provided the hepatic and common choledoch ducts be unaffected. Occasionally, the attacks of hepatic colic are very numerous and distressing; and a pathological condition appears to exist, which gives occasion to unusual depositions from the bile.

When these symptoms have continued for a time with extreme violence, an interval of rest is sometimes experienced, which is of longer or shorter duration, and may be followed by a renewal of the suffering in all its severity. Difference of sentiment has existed as to the cause of this alternation of pain and ease. Some have presumed that the recurrence of the suffering is to be ascribed to the passage of another calculus. The author has been disposed to regard the first paroxysm to be owing, in most cases, perhaps, to the progress of the calculus from the gall-bladder through the cystic duct, and the cessation to its discharge into the ductus communis choledochus, which is of much greater capacity; and the second paroxysm has appeared to him to be caused by the calculus reaching the extremity of the choledoch duct, which is known to be of smaller calibre than the rest of the canal. As soon as it clears this portion of the duct it passes into the duodenum, and the relief is permanent. If the evacuations be now carefully examined, a biliary calculus may be found mixed with the discharged fæces, but the calculus is not always discoverable even when the symptoms have been marked. It has been affirmed, that the subsidence of pain is no proof of the removal of the disease unless bile is discharged by stool or vomiting, and, as a general observation, this is true; but, at times, the evidences of bile in the evacuations are equivocal, and yet no doubt may exist as to a calculus having been discharged.

In consequence of the severe spasm, induced by the presence of the gall-stone in the ducts, signs of inflammatory action sometimes supervene,—as indicated by tenderness on pressing the right hypochondriac and the epigastric regions, and more or less febrile indisposition. These

symptoms usually subside, and the individual is speedily restored to health; but, in other cases, lymph may be thrown out, and the duct be permanently closed; or ulceration of the gall-bladder, or of the ducts, may ensue, with all the fatal symptoms previously depicted. In other cases, it has been found to have made its way into the duodenum by ulcerative absorption, and to have been discharged.

Causes.—Age certainly affords a predisposition. Biliary calculi are extremely uncommon in young children. The author knows of no case of the kind. They would seem to be more frequent after the age of forty or fifty; and to occur most commonly in persons of sedentary habits, and hence, perhaps, in women oftener than men. All observers, indeed, agree, that women are more liable to them, although they differ much as to the ratio; and by some, as by M. Andral, it is affirmed, that they are more subject to them about the critical period. It has been estimated that in England, five-sixths of the cases of gall-stones occur in the female sex; but the estimate does not appear to be founded upon any data observed numerically. The attacks are said to occur more frequently in winter than in summer, but here, again, data are wanting, and all that we are perhaps justified in affirming, with M. Thénard, is,—that the calculi appear to form less in summer than in winter. The disease of the liver in which gallstones are most frequently seen is cancer. They are also found in conjunction with cancer of other parts. They seem, according to Dr. Budd, connected with the cancerous diathesis rather than with cancer of the liver itself, which probably, he thinks, gives no additional tendency to them except when it involves the gall-bladder or causes the bile to stagnate in it, by narrowing the cystic or the common choledoch duct.

Pathological Characters.—The number of calculi met with on dissection is at times considerable. It rarely, indeed, happens, that they are solitary. Their number varies from a few to some thousands. As many as 3646 have been counted, according to Morgagni. When they are so numerous, they are usually very minute: on the other hand, they have been seen as large as a hen's egg, and even larger.

In regard to chemical composition, biliary calculi are of different kinds. The analysis of healthy bile, by Muratori, assigns it for constituents—peculiar fatty matter; colouring matter—*cholepyrrhin*, *biliphœin*;—cholesterin combined with soda; picromel; extract of flesh; mucus; soda; phosphate of soda; phosphate of lime, and chloride of sodium. Now, certain of the biliary calculi are formed of almost pure cholesterin; others of inspissated bile or at least of its resinous matter, with the nature of which chemists are not yet well acquainted; and others—and the greatest number—consist of cholesterin and thickened bile in various proportions. All, moreover, contain concrete mucus or albumen, phosphate and carbonate of lime, and traces of oxide of iron. Occasionally, the proportion of calcareous salts is very large, so that the calculus seems to be formed of them entirely with a tinge of bile.

Calculi of pure cholesterin are white, transparent, and of a crystalline, radiated, or laminated structure; they are of a yellowish, greenish, or green colour, and they may still preserve their semi-dia-

phanous character, and the same texture, when a small quantity of the colouring matter of the bile is combined with them. Their shape is often ovoid, and they sometimes attain the size of a pigeon's or sparrow's egg. More than one rarely exists in the gall-bladder. They are insoluble in water, in which they swim; but are soluble in hot alcohol, from which they are precipitated, on cooling, in brilliant plates; they are soluble, also, in oil of turpentine, and the caustic alkalies. Exposed to a high temperature, they soften, melt, and are volatilized without decomposition. They are the *cholesteric* calculi of some writers.

The biliary calculi, that are formed wholly of inspissated bile, or of the resinous colouring matter of the bile—termed the *inspissated*—are not common in man, but are the most so in animals, especially the ox. Their colour is brown and blackish; their size not considerable, varying from that of a pea to that of a hazelnut; their surface granular, and studded with hard irregularities; their consistence considerable, and their specific gravity greater than that of water. They have no regular arrangement; but in the centre a cavity is sometimes found filled with a blackish, shining mass, very distinct from the rest of the concretion. They have a bitter taste, and are affected by reagents, like inspissated bile. When this same matter, mixed with a very slight portion of cholesterin, exists at the surface of other concretions, it forms a brownish layer of greater or less thickness, constituting, at times, a kind of rind of an ebony colour.

The most common calculus is, doubtless, that which is composed of a mixture in various proportions—or of alternations—of cholesterin and the colouring resinous matter, forming the *mellitic* calculus of some. These calculi are rarely solitary. They are frequently seen crowded together in the gall-bladder to the number of 15, 20 and upwards: at times—as already remarked—of some thousands. When only one exists, it may be very large; as large as a hen's egg, and even larger. When they are in numbers, they are usually small, often not larger than a grain of sand. They are soft, smooth, and when there are several together, of a polygonal shape,—all indeed, that the author has seen, have been so; when solitary, they are of an oval or round shape. Their colour is determined by the proportion of two substances that enter into their composition. Usually, they are of a honey-like hue, whence the epithet *mellitic*. Some of them are blackish, brown, yellow, or greenish at the exterior; yellow, of different shades, or greenish, internally; others, again, are marbled, or form mixtures of green, yellow, and white. They bruise and break readily, and may be reduced to a powder, which is greasy to the touch.

The examination of a great number of biliary calculi has led to the belief, that the yellow colouring matter of the bile constitutes the nucleus of a greater part of them. M. Vogel enumerates the following as the principal forms of biliary concretions, arranged according to their physical character. 1. Fine precipitates of bile pigment and crystallized cholesterin, imbedded in mucus, mixed with epithelium, the cells of which are sometimes incrusted. 2. Biliary gravel—minute concretions of the size of a hemp-seed, or grain of sand; occasionally

many such concretions are united by mucus so as to form a large mulberry-shaped calculus. 3. Soft biliary concretions, which in a recent state readily admit of being moulded between the fingers, consisting of crystalline depositions of cholesterin, between which there is bile pigment. 4. Crystalline calculi, consisting for the most part of cholesterin, nearly colourless, transparent, with a crystalline fibrous fracture, granular on the surface, and usually covered with minute crystals of cholesterin. 5. Dark calculi, of a reddish-brown colour, and earthy fracture, which does not become bright by friction. These consist for the most part of bile pigment. A variety of this species, which is of a dark brown, almost black colour, exhibits a red, mulberry-like appearance. These calculi seem to consist of a peculiar modification of bile pigment. 6. Calculi, consisting for the most part of carbonate of lime: they are crystalline, with rough surfaces, terminating in sharp angles, of a clear, or sometimes rather brown colour. 7. Gallstones of a whitish colour, saponaceous feeling, and concentric laminated arrangement, which on scraping assume a polished appearance, and consist for the most part of cholesterin. 8. Gallstones, consisting of alternate white layers of cholesterin, and dark yellow layers of bile pigment:—the two last kinds by far the most common.

Biliary calculi are found in various parts of the excretory apparatus of the bile;—in the hepatic ducts of the interior of the liver; in the cystic, hepatic, or common choledoch duct; in the intestinal canal, or in the cavity of the peritoneum or elsewhere, owing to the perforation of the parietes of the canal, whence they may have escaped. As to the causes that give rise to their deposition from the bile, we are much in the dark. It has been imagined, that there may be an excess of cholesterin in the blood; that inflammation of the biliary apparatus may favour the deposition of cholesterin, and that such deposition may be further favoured by lesions of the gall-bladder, which give rise to the formation of small diverticula in which the concretions are formed. These and various other hypotheses, have been hazarded; but light is still wanted, and further observations are necessary on this interesting topic of pathology.

Treatment.—The indications of treatment in the *chololithus means* are sufficiently evident. The pain is occasioned by the violent spasms of the ducts around the calculus, and the mode of relief is for the calculus to pass onwards into the intestine; at the same time, there is danger of the supervention of inflammation of the ducts. The indications will, therefore be;—*First*, To allay the spasm, which prevents the progress of the concretion; *Secondly*, To employ remedies, that may solicit its onward course; and *Thirdly*, to have recourse to agents, that may prevent or remove inflammation. It has been already remarked, that a diagnostic symptom of gall-stone is—the pulse being unaffected whilst the patient is writhing in agony. Bloodletting can, therefore, only be suggested as a means of resolving spasm, and of preventing inflammatory action. The author has always succeeded in such cases, without the necessity having arisen to make use of the lancet; but, at the same time, if the patient be plethoric,

no hesitation should exist in having recourse to it. It is an excellent antispasmodic; and if pushed to the induction of full relaxation, as indicated by incipient or complete syncope, it may resolve the spasm, and facilitate the progress of the calculus. Bloodletting, too, is a good preparative to the use of the most important antispasmodic—opium. If bloodletting be premised, it should be followed up by full doses of the anodyne;—commencing with not less than two and a half, or three grains of opium in the form of soft pill, or the equivalent of the tincture, the black drop, or the preparations of morphia. In this, as in other spasmodic diseases, it is astonishing how much opium may be administered without inducing narcosis. The author has sat by the bedside of a delicate female labouring under this affection, to whom he has administered the *tinctura opii* every few minutes by the teaspoonful, until, in the course of an hour, she had taken an ounce by measure, and without the supervention of narcosis, or of any evidence, at the time or afterwards—except the relief of pain—that an opiate had been administered.

It has been remarked, by Dr. Wm. Thomson, that a starch and laudanum glyster will frequently produce immediate relief.

℞.—Mucilag. amyli f ℥iv.
Tinct. opii ♏ 40.—M.
To be repeated every six hours, if necessary.

Where objections exist to the use of opium by the mouth, the author is constantly in the habit of adopting this course, and with entire impunity. The object in the administration of anodynes, should be the alleviation of the pain, care being taken not to induce narcosis—which, as already remarked, does not easily supervene in such cases. Dr. Gerhard, of Philadelphia,—it may be proper to add—in commenting upon the recommendation of Dr. W. Thomson, has the following remarks:—"Against this advice we must protest most decidedly. No physician is authorized to prescribe so large a dose of laudanum as an enema, knowing, as he must, that sudden death will occasionally result. It is true, that in the large majority of cases, forty minims of laudanum may be given with impunity; but it is equally true, that the dose is occasionally a fatal one. We do not believe that more than forty drops of laudanum should ever be given as an injection, unless in the rare cases in which the suffering of the patient may compromise life." These views are the honest convictions of their author, but his apprehensions can scarcely be considered to rest on any sufficient foundation. The author is not aware of a single case of biliary calculus, in which death—or even slight narcosis—has resulted from an enema of even forty minims of laudanum.

After the spasm has been in some degree moderated, by the use of bleeding or opium, or both combined, a cathartic enema—especially of turpentine, which is, in addition, an excellent revellent—may be properly administered. The increased peristaltic action, in this manner induced, cannot fail to be felt by the biliary ducts now in a state of relaxation, and the calculus may thus be solicited in the direction of the bowel. A sequence of remedies, advised on respectable authority, does not appear as satisfactory as the one just laid down. Dr. Stokes

advises to bleed first, then leech, next employ purgatives; and, when the bowels are emptied, have recourse to opiates. As to leeches, their application is difficult; they interfere, likewise, with the use of other agents, and, withal, they are by no means as effective antispasmodics as bleeding from the general system. To aid the bleeding and narcotics in allaying the spasm, the warm bath has been found serviceable. The patient should be kept in it for a considerable time, and, whilst he is immersed, the opiates may be administered. Hot applications to the side have also afforded relief. On the other hand, pounded ice applied to the epigastrium has succeeded, according to M. Bricheteau, immediately, in many instances, in allaying the pain, and in retarding its return, when it has not succeeded in dispelling it entirely.

Much difference of sentiment exists as to the employment of emetics to fulfil the second indication; or, in other words, to solicit the onward progress of the calculus. In simple cases, where there is no accompanying inflammation, organic disease of the liver or distension of the gall-bladder, they would appear to be appropriate remedies,—the only inconvenience, likely to attend their employment, being the painful succussion of the parts affected, which they must necessarily occasion. The indirect emetics, whose action is preceded by nausea,—as tartrate of antimony and potassa,[a] or ipecacuanha,[b] or both combined,[c] are the most appropriate.

[a] R.—Antim. et potass. tart. gr. iv.
Aquæ f℥iv.—M.
Dose, a fourth part, every 15 minutes, until vomiting is induced.

[b] R.—Ipecac. pulv. gr. xv. ad xxx.

[c] R.—Antim. et potass. tart. gr. ij.
Ipecac. pulv. gr. x. ad xx.—M.

The precursory nausea relaxes the spasm of the ducts, and the subsequent efforts at vomiting exert a degree of succussion and of traction on the biliary passages, which aids the dislodgment of the calculus from its position, and its discharge into the duodenum. With the same view, a brisk cathartic, and especially one which, like calomel, exerts its action on the upper part of the intestinal canal, may be administered alone or combined with the turpentine enema, as advised above.

R.—Hydrarg. chlorid. mit. gr. v.
Jalap. pulv. gr. xij.
Zingib. —— gr. iv.—M.

To meet the third indication,—which consists in preventing or removing inflammation,—the employment of general or local bloodletting, by means of leeches, may be demanded. In almost all cases a certain amount of febrile irritation supervenes, with more or less tenderness on pressing the right hypochondriac and epigastric regions, but it commonly passes off without any treatment whatever.

As to the various means that have been proposed for dissolving the calculi, it is not necessary to say more, than that they obviously cannot come into direct contact with them. For a long time, the *Remède de Durande*, which consists of three parts of *sulphuric ether* to two parts of *essence of turpentine*, enjoyed a high reputation. It was given every morning, in the dose of from two scruples to a drachm, and M. Durande recommended, that it should be continued until the patient had

taken a pound of it; after which the treatment was to be finished by purgatives. It frequently, however, induced excessive irritation, and, at the present day, but few employ it. As a solvent, it could have exerted no agency.

After the calculus has passed into the intestines, it may be well for the patient to make use of saline cathartics for some time to keep up a gentle action upon the bowels. If his circumstances and the season will admit of it, the change produced by a visit to any of the saline or sulphureo-saline waters, with the effect of the waters themselves, cannot fail to be advantageous. Should this be impracticable, a Seidlitz powder may be taken twice or thrice a week, or an appropriate saline solution may be a succedaneum for the saline mineral waters drunk at their source.

℞.—Magnes. sulphat. ℥j.
Potassæ bitartrat. ℥j.
Ferri sulphat. gr. x.
Aquæ bullientis Oij.—M.
Dose, a wineglassful, every morning.

It is all-important, also, to attend to diet; to recommend a moderate allowance of animal food, and to limit the quantity of aliments which probably go more to the formation of bile, as spirituous liquors, butter, cream, and oleaginous matters in general, and sugar, articles which consist chiefly of hydrocarbon; and to augment as far as practicable the consumption of oxygen, by exercise in the open air,—as it is not improbable, that where the due amount of the "elements of respiration"—as they have been called by the school of Giessen—is not consumed, they may be directed to the liver, and lead to the undue secretion of bile by that organ. Where the patient has perpetual returns of this painful malady, such a course is indispensable; and it may be aided by exercise, change of air and scenery, such as travelling affords, especially when combined with the use of alkaline mineral waters like those of Saratoga; or of the sulphurous saline waters of Virginia, drunk at the source.

XX. JAUNDICE.

Synon. Icterus, I. flavus, I. verus, Aurigo, Morbus regius, Arcuatus morbus, Morbus auriginosus, Ileus icterodes, I. flavus, Choloplania, Cachexia icterica, Cholihæmia, Icteritia flava, Fellis superfusio, Yellow Jaundice; *Fr.* Ictère, Jaunisse, Bile répandue; *Ger.* Gelbsucht, Königskrankheit, Gallenversetzung.

The most prominent evidences of jaundice—as the French word *jaunisse* imports—are *yellowness* of the skin and conjunctiva. It can very rarely be esteemed an idiopathic affection. It is generally, indeed, symptomatic of many of the diseases of the biliary apparatus, already described.

a. *Jaundice of the Adult.*

Diagnosis.—Usually, before an attack of jaundice, the gastro-intestinal functions are more or less disordered. The patient complains of loss of appetite and dyspepsia, with vertigo, nausea, and perhaps vomiting, flatulence and tension in the epigastric and hypochondriac regions, with furred and yellow tongue. Usually, too, there is more

or less lassitude and dejection of spirits. After these symptoms have continued for a longer or shorter period, the eyes are observed to be yellow, as well as the skin: the urine may be hot, is very high-coloured, sometimes of a green hue, turbid, and tinging the linen, owing to its containing bile pigment. It may also contain other constituents of the bile. M. Simon detected biliary resin in icteric urine, and M. Gmelin found cholesterin in a case where the flow of bile was impeded. The alvine evacuations are clay-coloured, owing to the absence of bile;—although this last symptom may not be very evident. Commonly, the bowels are confined; and, often, there is morbid sensibility when pressure is made over the region of the gall-bladder and capsule of Glisson; but in the absence of pressure, the uneasiness is generally referred to the epigastrium. This tenderness on pressure is considered to be owing to inflammation of the upper part of the digestive tube, which has been esteemed an extremely frequent cause of jaundice, and is, generally speaking, independent of any mechanical obstruction of the gall-bladder or biliary ducts. Taking all the cases into account, this form of jaundice has been regarded by Dr. Stokes, as the most frequent.

In the mildest forms, the pulse is but little affected, but where it is owing to, or connected with, inflammation of the liver, or of the lining membrane of the stomach and bowels, the circulation is quickened. In very bad cases, the brain is more or less affected, and, as has been properly remarked, the supervention of symptoms denoting an affection of the nervous system, must be looked upon with anxiety in any form of the disease. Coma is a most alarming complication. Robust patients have been known to die with symptoms of oppressed brain, within thirty-six hours after the sudden appearance of intense jaundice. Many cases have been detailed, which were complicated with this formidable symptom, the majority of which resisted all the ordinary resources of art; and Dr. Stokes affirms, and Dr. Corrigan accords with him, that he has never seen a case, in which the coma was distinctly established, terminate favourably. The experience of the author has been more fortunate; but still, the complication must, in all cases, be looked upon as alarming, and more so even in hot, than in temperate climes.

It is proper to remark, that the colour of the skin is not always the same: it may vary from a citron almost to a black, whence the name *black jaundice*, applied to it in some cases. Usually, too, before the coloration appears, there is a disagreeable itching or tingling of the whole surface, which may continue for some days; as long, indeed, as the morbid condition of the blood. The odour of the perspiration is said to resemble that of musk, but the author has not observed this.

The attacks of jaundice sometimes come on insidiously; at others, especially when the disease originates from a mortal cause, it may appear almost instantaneously. A case is related by Dr. Mackintosh, of a man, who sat down to dinner in tolerably good health, but was soon compelled to retire, owing to feeling indisposed, his whole surface being suddenly tinged. The first circumstance, that excited attention to him, was a remark which fell from himself, that the tablecloth was

of a greenish colour. It is said that Murat, on learning that his queen had assumed the sovereign power at Naples, in his absence, fell into a violent rage, and was almost instantaneously jaundiced. In referring to the case cited above, Dr. Mackintosh states, that he has known several individuals affected with jaundice, who saw every object coloured. It is strange, that this *chromatism*, as it may be termed, should exist in a very few cases only. Most of the secretions are unquestionably tinged yellow, but not all. Bilin and biliphæin have been found in the sweat, and sometimes in such large quantity as to colour the linen yellow, and to communicate a bitter taste to the perspiration. The colouring matter of the bile is rarely found in mucus or milk, for example. The yellowness of the conjunctiva is, however, one of the pathognomonic symptoms. Bile is also necessarily present in the blood-vessels of the retina; yet yellow vision is not common. In the experience of one observer, Dr. J. P. Frank, it was observed but five times in about a thousand cases. The cause of the phenomenon, when it does present itself, has been a question. It has been supposed to be owing to inflammation of the cornea, the vessels of which become dilated, and receive yellow blood, but strict observation has not always exhibited such a pathological state. The most probable supposition seems to be,—that the humours themselves are tinged yellow; and it has been suggested, that where vision is not yellow, they may have escaped the tinge. As, however, the phenomenon is observed in very few cases only, the coloration of the humours must be an uncommon occurrence, provided the fact and the explanation be true:—yellow vision, in other words, must be an exception to the general rule in this disease. Lastly, the phenomenon has been ascribed to direct nervous influence, on the ground, that patients, in other diseases, as in typhus fever, without being in the slightest degree jaundiced, have seen everything yellow. It is possible, that all these conditions may be, occasionally, concerned in the causation. Commonly, the disease is tedious; its duration varying from a week to three, four, five, or even longer. As a general rule, too, when uncomplicated, it terminates in health, but where the liver is diseased, or the encephalic complications, before described, supervene, the result may be fatal. Occasionally, the indisposition is so trifling, that the patient attends to his business as usual; and Dr. Stokes states, that he has seen persons, who laboured under this affection for more than a year, and yet who had, during the whole of that time, the digestion good, the bowels regular, the flow of urine natural, and the circulatory, nervous, and respiratory systems apparently conformable to the healthy standard.

Causes.—These are very numerous; inasmuch as jaundice may be the result of any organic lesion, which acts directly or indirectly on the liver and the biliary ducts. Allusion has already been made to moral emotions as a cause. Of 19 cases, observed with great care in reference to causation, by M. Piorry, symptoms of gastro-enteritis existed at the outset in eight; and, in one, a violent blow had been received on the head, three months previously; in two cases blows had been inflicted on the abdomen on the right side, a short time before the invasion of the jaundice; and in almost all the liver was large. There

were six cases, in which the first symptoms were referable to hepatitis; one in which there was disordered menstruation, and two others in which the patients did not assign any appreciable cause for the disease. In two instances, constipation had preceded. M. Piorry considers, from all his observations, that along with a moral, there is always a physical, cause.

Obstruction of the ducts from any cause,—as from hepatic tumours, gall-stones, or enlargement of the absorbent ganglia in the vicinity of the ducts,—are evident causes, by obstructing the course of the bile, and occasioning its absorption into the blood-vessels; and mention has already been made of inflammation of the upper part of the alimentary canal as an extremely frequent cause of jaundice. This is, generally speaking, independent of any mechanical obstruction of the gall-bladder or biliary ducts, and probably gives occasion to a diminution or arrest of the biliary secretion. It is a variety of jaundice from non-elimination. Where the jaundice arises from hepatitis, the inflammation is said to have been most commonly situate on the concave surface of the liver. At one time, it was the common belief, that when the disease appears suddenly and without any premonitory symptoms, it is owing to spasm, or to the opposite condition—paralysis, of the gall-ducts; but the belief does not appear to rest on any pathological observations.

Pathological Characters.—The general opinion of pathologists is, that jaundice is owing to the presence of the bile, or of its elements, in the blood, *cholæmia*. MM. Deyeux, John, Lassaigne, and Thénard did not find that the yellow principle of the serum of the blood, in a case of chronic jaundice, had either the taste or the smell of the bile, and they inferred that the bile was not mixed with the blood. On the other hand, Clarion found in the serum a green matter similar to that of the bile; and Orfila found bile, or at least biliary resin, in the blood of three jaundiced individuals. Chevreul found, in the blood of children affected with the disease, the colouring matter of the bile—*biliphœin*—but not picromel; and MM. Boudet, Lecanu, and Simon found the pigment present in these cases. M. Simon's analysis of the blood in icterus gave the following results.

	Analysis 44.
Water	770·000
Solid residue	230·000
Fibrin	1·500
Fat	2·640
Albumen	126·500
Globulin	72·600
Hæmatin	4·840
Hæmiphæin, with biliphæin	2·640
Extractive matters and salts, with biliphæin	16·500

The peculiarities of this blood are its large amount of solid constituents, owing to an increase, not of the corpuscles but of the albumen, the diminished quantity of fibrin, and the excess of colouring and extractive matters and salts. The fat was not particularly increased. If bile be placed in contact with concentrated nitric acid, it assumes a deep-green hue, which passes to blue on the addition of a fresh portion of acid, and to red if still more be added. The test is applicable to the serum of the blood and the urine of the jaundiced, but the bile must

be contained in some quantity in those fluids in order that the effect shall be decided. In icteric urine, for instance, it frequently happens, that nitric acid only developes the green colour—the bile, according to M. Donné, being in too small a proportion to give rise to the blue and the red tints. Berzelius considers it best to evaporate the jaundiced urine to dryness, treat with alcohol, evaporate the tincture to dryness, and then add nitric acid.

The fact of bile—or at least its colouring matter—*cholepyrrhin*, *biliphœin*—being in the blood is likewise confirmed by the circumstance already stated, that in cases of jaundice, where an opportunity has occurred for *post mortem* examination, more or less obstruction has commonly existed to the course of the bile. It was found, also, experimentally, that icterus could be induced on animals, at will, by tying the branches of the hepatic duct. All the portions of the liver, that corresponded to the branches of the obliterated trunk, were filled with bile, and jaundice supervened. Still, a question may arise, in these cases whether the bile is absorbed and passes into the mass of blood; or whether, owing to the obstruction of the duct, bile is no longer separated from the blood, but remains in it; as urea is found in the blood after the kidneys have been extirpated and kyestein is found in the urine, when any impediment occurs to the lacteal secretion. The latter opinion has been embraced by some; and a recent pathological writer, Mr. H. Mayo, adopts the view, that ordinary cases of jaundice depend upon suppression of bile, and that the bile, abnormously accumulated in the blood, finds vent in the secretions of other parts, which thence become coloured yellow. In confirmation of this opinion, he states, that bile is detected in the blood of jaundiced persons, whilst the liver, in those who have died of the disease, is generally pale, and without bile.

In the difficulties of the subject, it has been supposed by some, that jaundice consists in an altered condition of the blood independently of the bile; but if such condition exist it cannot well be an altered state of the colouring matter of the blood, inasmuch as the red particles are apparently unchanged; and, moreover, the adventitious colouring matter is present where there are no red corpuscles, as in the serum, and in different secretions obtained from the blood. Under every view, the rapid—almost instantaneous—development of jaundice, under certain moral affections, is sufficiently difficult of explanation. It is not unique, however; for we have examples of other singular changes in the body under similar circumstances—as of the hair changing colour in a short space of time under terror, &c. &c. On the whole, we are justified, perhaps, in the conclusion, that jaundice is most commonly the result of the absorption of the yellow colouring principle of the bile from the biliary passages, but that it may possibly be owing, in some cases, to arrest of the biliary secretion, and the retention of the bile or its elements in the blood.

Treatment.—The therapeutical management of jaundice must obviously vary according to the accompanying pathological condition. If the disease have come on spontaneously, and the most accurate investigation cannot detect any of the morbid states previously pointed

out; if there be no epigastric pain, and no evidence of accompanying gastro-duodenitis; if—in other words—there be only evidence of the bile having passed into the blood, and time alone is required to correct the *error loci*—no particular treatment is demanded. Rest, laxatives, moderate diet, and the use of diluents—as lemonade—may be all that is required. If, however, fever exist with manifest signs of inflammatory action of the lining membrane of the stomach and bowels, or of the liver, a more vigorous treatment is necessary. Leeches may be applied over the affected region:—the French advise them also to the anus;—ice-water may be allowed, and the whole of the antiphlogistic treatment be inculcated,—using the warm bath; keeping the bowels open by any gentle laxative—as Epsom salts with or without senna, or castor oil—or by enemata; and carefully avoiding every form of mental or corporeal excitement. In India, where this, as well as every other hepatic affection is extremely frequent, the most successful plan of cure is the antiphlogistic;—depletion by general bloodletting, and leeches; active purgatives, tepid baths; low diet, and quiescence in the beginning of the disease, followed by mild cathartics, and a small blister over the region of the gall-bladder.

In cases of chronic jaundice, as in that form which is induced by depressing passions, and which may continue for days, weeks, or months; and in which, if delirium or coma supervene, the danger is appalling, Dr. Corrigan, of Dublin, extols in unmeasured terms the administration of emetics. "I can assure you," he says, "that in an ample experience of four or five years since I first adopted this line of treatment, I have not had a single failure." "For the cure of this disease, it will be quite unnecessary for you to prescribe any other medicine, save an emetic of half a drachm of ipecacuanha every second night, until the jaundice disappears. This frequently occurs after the action of the second emetic. It will not even be necessary for you to have recourse to purgatives, as the ipecacuanha, in most instances, relaxes the bowels."

The routinist, under the idea, that mercury is capable of modifying all disorders of the biliary system, whatever may be their nature, is in the habit of prescribing this agent in jaundice. In a simple case of the disease, it is difficult to see what can be its beneficial operation. The notion under which it is usually prescribed is, that it augments the biliary secretion; but if the pathology of jaundice consist, as many maintain, in the absorption of bile from the biliary ducts, any agent that will increase the secretion of bile cannot fail to act injuriously, and to augment the evil. Mercury, with a view of exciting biliary secretion, in such cases,—it has been judiciously remarked, by Mr. Twining,—would be as unreasonable as the administration of diuretics to a man with a distended bladder, and whose perspirations had a urinous odour, showing that urine was freely secreted and absorbed into the system, when we knew, at the same time, that he had an impervious stricture of the urethra. It is only, indeed, in cases, where there is reason to believe in the existence of chronic hepatic disease, that we can expect advantage from mercurials, and then not from any agency which they exert on the biliary secretion especially. Under

the new action, which they induce in the secretory system in general, they may act beneficially on the hepatic disease; and, by removing it, remove likewise one of its consequences—the jaundice.

When coma supervenes on jaundice, the case should be treated as one of hyperæmia of the encephalon; the head should be shaved; leeches or cups be applied behind the ears, or to the nape of the neck; blisters be directed to the same region, with revellent glysters (of turpentine) and sinapisms to the feet;—the treatment in short, elsewhere recommended for hyperæmia of the encephalon. In such cases, where the patient dies, and the head is examined, no lesion may be perceptible in the brain or its membranes.

b. *Jaundice of the Infant.*

Synon. Icterus infantum seu infantilis, I. neonatorum, Aurigo neophytorum, Pædicterus, Yellow Gum, Yellow Gown; *Fr.* Ictère des nouveau-nés; *Ger.* Gelbsucht der Neugeborenen.

This is a common affection in infants everywhere. It comes on soon after birth, without any known cause; continues for some days, and gradually disappears;—the only other symptom, generally observed, being perhaps unusual drowsiness. It has been presumed to depend upon some irritation of the intestinal canal, which seems to result from the circumstance of the digestive system being called into active exertion for the first time, and receiving a new stimulus from the mother's milk. It is more probably owing to the common choledoch duct being obstructed by inspissated mucus, or by the meconium, which has collected in the intestines during utero-gestation. By some, it has been referred to too viscid a state of the bile; and by others to a congested state of the liver; and it would certainly appear, that the organ is frequently congested in new-born infants. It is an affection of no consequence. Even in torrid climes, recovery is so general, that opportunities have not occurred for discovering the precise pathological condition. It rarely exists at birth; but is commonly observed from the third to the seventh day; seldom in the second or third week, and terminates in health in the course of a week or two.

The disease would probably yield without any treatment whatever; but inasmuch as the cause would appear to be, in many instances, at least, obstruction of the duct, it may be well to facilitate its removal by gentle laxatives;—as the *syrupus rhei*, (a teaspoonful,) magnesia, (gr. iv.—vj.) or castor oil.

℞.—Ol. ricin.
Syrup, āā f℥ss.—M.
Dose.—A teaspoonful, occasionally.

XXI. MORBID SECRETIONS OF THE LIVER.

A modified condition of the fluid secreted from the liver was, at one time, regarded as the cause of almost all disorders of the digestive apparatus, and even of organs remotely connected with it; and the evacuations were regularly inspected, with the view of determining, whether the bile was secreted in too great or in too little quantity, or was of improper quality. Were we acquainted with the

characters of the bile physiologically, when mixed with the different secretions from the alimentary canal, and the various ingesta,—as well as with the exact quantity, that ought to be secreted in plenary health,—we should have a point of departure, whence we might deduce the pathological manifestations. It is clear, however, that these data must generally fail us. The consideration of the different diseases of the stomach and bowels, and of the liver and pancreas has shown, that numerous agencies must interfere with the biliary secretion independently of the condition of the liver itself; and that we should infer most erroneously were we always to ascribe the varying characters of the fæcal evacuations to a morbid condition of the bile.

The biliary secretion may be in too great quantity, or too sparing; or it may be perverted; and each of these conditions is worthy of a brief notice.

a. *Augmentation of the Biliary Secretion.*

Synon. Bilious plethora, Bilious hyperæmia, Polycholia.

Bile is certainly, at times, secreted in larger quantity than usual; but it is not easy to say on what this pathological state is dependent. The liver—like other organs—may increase its secretion under some source of secretory irritation; or, irritation existing elsewhere—as in the stomach or upper part of the intestinal canal—may be propagated to the liver, which becomes affected secondarily. This is probably the mode in which *Polycholia*—as it has been termed—is generally induced; and hence, where evidence exists of redundancy of bile, the pathologist properly looks to the condition of the lining membrane of lhe alimentary canal. It has been elsewhere stated, (*General Therapeutics and Materia Medica*, 3d edit. p. 98, Philad. 1846,) that when an emetic is administered which gives occasion to much retching, bile is almost sure to be freely evacuated; and that this circumstance is no evidence, that the secretion, prior to the administration of the emetic, was superabundant. It is only an evidence, that an emetic has been taken, the irritation, produced by which, is propagated to the liver, and induces a more copious secretion from that viscus. In like manner, under the repeated administration of cathartics, especially of such as act upon the upper part of the digestive tube, the alvine evacuations may exhibit, that the secretion of the liver is largely augmented. Yet the augmented secretion may have been wholly owing to the action of the cathartic. In neither of the above cases, therefore, should we be justified in considering the individual *bilious*. This result was common in the system adopted by Mr. Abernethy, and which still prevails with certain therapeutists, of appealing to the liver in all cases in which the stomach is disordered; by requiring, as has been quaintly expressed, "a blue pill at night and a pot of fæces in the morning." The lining membrane of the stomach and bowels—already irritated or inflamed in many of these cases—was often still more morbidly implicated; and, as an almost necessary consequence, the irritation was communicated by continuous sympathy to the liver, so as in some cases, where the inflammation was considerable—to diminish or arrest, and in others to augment, the secretion of bile.

An intelligent writer—Dr. Billing—has drawn attention to what he considers a common error in regard to a white appearance of the tongue, which, he affirms, is always the accompaniment of an empty stomach. "Persons," he remarks, "who are in the habit of thinking themselves 'bilious,' and taking physic, look at their tongue when they rise in the morning, and find it white: a good breakfast will make it look red, unless they take a dose of salts, Seidlitz powder, or sometimes even whether they do or not. The same persons will perhaps put out their tongue before a looking-glass just before dinner-time; and, seeing it white, forego a part of the wholesome meal which would bring the tongue to a natural colour of redness, which it assumes after eating, from its natural paleness before eating, unless they be gourmands and hypochondriacs at the same time; in which case they will run the hazard of eating, and take a calomel 'peristaltic persuader' afterwards. I have been constantly in the habit of warning my young medical friends to consider, when they see a white tongue, what time of day it is, and *not to purge* for merely a white, or more properly a *pale* tongue." The observation of the author is confirmatory to a great extent of these views, and he certainly has often witnessed the effects of repeated cathartics in augmenting the milkiness of the tongue, and the good effects of the course recommended by Dr. Billing.

Granting, however, that an augmentation of the biliary secretion may, and does, take place at times, it may be properly asked, whether this circumstance would necessarily give rise to any morbid phenomena? The author is disposed to give a negative opinion, and where bilious diarrhœa occurs, which has been esteemed the principal symptom of bilious plethora, it may be rather owing to healthy bile passing over the irritated surface of the intestines, which has caused the increased secretion from the liver, than to the action of too great a quantity of bile on a healthy surface. A case, analogous to this, is met with daily in the urinary organs. If the secretion from the kidney be greatly augmented, we do not necessarily observe symptoms of irritation or inflammation of the membrane over which the urine passes; but if the membrane be inflamed as in blennorrhœa, then the healthy urine gives rise to great irritation.

Along with diarrhœa of a bilious character, augmentation of the biliary secretion is said to be indicated by languor, indisposition, want of appetite, intense headache, with continued, remittent, or intermittent fever,—symptoms which equally denote the existence of gastro-duodenitis, or an approach thereto.

Treatment.—In regard to the management of such cases, difficulty exists. If the cause be any form of gastro-enteritis, it must be combated upon general principles; but, for the pathological reasons before given, emetics and cathartics cannot be indicated. Perhaps, in such cases, one of the best remedies would be—the general action on the secretory organs, which mercury, administered so as not to affect the bowels, but to gently touch the mouth, is capable of inducing.

b. *Diminution of the Biliary Secretion.*

Synon. Torpor of the Liver, Torpor of the biliary organs.

This is a condition, on which, as has been remarked by M. Andral, "much was said about twenty years ago, and of which much is still said in England." M. Andral might have added in this country also. As a general rule, it is considered to be evidenced by want of colour, infrequency, and smallness of the evacuations, disordered digestion, and the various symptoms of dyspepsia. It may be caused by hepatitis, directly or indirectly induced; and, in severe cases of inflammation of the duodenum, the secretion may, for a time, be arrested; but if the inflammation continues, without hepatitis supervening, the secretion from the liver may be subsequently augmented and perverted.

Treatment.—In a chronic case of this kind, purgatives that act upon the upper portion of the tube are clearly indicated, and if mercurials be administered, it must be with the view of producing their local action upon the duodenum, and thence upon the liver,—not to diffuse their action over the secretory system in general, as in augmentation of the biliary secretion. In such cases, the *pilula hydrargyri*, or the *hydrargyri chloridum mite*, with saline cathartics, given so as to affect the bowels, will be advantageous.

℞.—Pil. hydrargyri gr. v.:—vel
Hydrargyri chlorid. mit. gr. ij.—iij.
formâ pilulæ.
To be taken at bed-time.

℞.—Magnes. sulphat. ℥ss.
Potassæ bitartrat. ℥j.
Aq. bullient. Oj.
Dose, a wineglassful, night and morning.

They should be so administered as to act slightly and daily on the bowels; the mercurials being given once or twice a week so as not to induce their peculiar action on the system. The inspissated bile of the ox or the swine has likewise been administered in these cases. (See p. 154.)

c. *Perversion of the Biliary Secretion.*

The bile undergoes various changes in disease. Its colour is altered, its quantity modified, and its physical and chemical properties present the greatest diversity of character. Cases of such alterations of this fluid are numerous. It is recorded to have been found black, grayish, or colourless; thick, viscid, pitchy, concrete, thin and transparent, acrid, acid, &c. &c. Yet the evidence of these changes are not great in the living body; and it is difficult to say—when either the discharges from the stomach or bowels exhibit an unusual character, that might be referred to bile—whether they are really dependent upon the morbid condition of that fluid, or upon some pathological secretion from the lining membrane of the stomach or bowels. This difficulty is signally exemplified by the fact, of every day occurrence, of green evacuations in infancy, which were at one time referred to morbid bile; but which a better pathology instructs us are owing to predominance of acidity—the admixture of acids with healthy bile producing a green colour.

Treatment.—In almost all—probably in all—cases, the liver is dis-

eased directly or indirectly, and it is important for the pathological inquirer and therapeutist to investigate the treatment of the primary affection. Generally, this is not an easy matter; and, accordingly, it is difficult to lay down any precise plan of treatment. Where the case admits of it, it may be advisable to endeavour to effect a total change in the secretory system, which can be best done by the administration of mercurials, pushed so as to slightly affect the mouth. It must, also, be borne in mind, that by the constant repetition of powerful cathartics, we can morbidly modify the secretion from both the liver and the follicles of the intestines,—a fact, which should be held in special remembrance where the practitioner is disposed—as was more the case formerly than now—to lay down the indication, that cathartics must be persevered in so long as the alvine evacuations present an unhealthy character.

CHAPTER IV.

DISEASES OF THE URINARY APPARATUS.

The diseases of the urinary apparatus are more frequent than those of the glandular organs that have been considered. They are likewise—as a general rule—more readily diagnosticated. As the kidneys, however, are double, when one is diseased, the other may, in a great measure, supply its place, so that very extensive changes may occur in one of them, without any decisive disorder in the urinary secretion.

The pathologist must bear in mind the position of the *kidneys*, which are the organs that secrete the urine;—that they lie on each side of the spine in the lumbar region; and that their average length is about five inches, their breadth about three inches, and their thickness about an inch and a third;—their united weight amounting to about six or eight ounces. They may differ, however, greatly in size, without our being able to consider their condition one of disease. Their colour is brownish, and their substance denser than that of other glandular organs, but they may be extremely pale or livid, owing to cadaveric stagnation of blood in them, without our being able to consider these appearances morbid. Sometimes, one of the kidneys, instead of being in the lumbar region, is placed in the iliac fossa or in the pelvis,—a malformation which has been detected during life, both by remarking the tumour in the iliac fossa, and feeling that the kidney was absent from its usual place, on causing the patient to lean forward on his knees and shoulders in bed, and then grasping the loins. At times, the kidneys are connected together by an extension of their substance across the spine, forming what is termed the *horse-shoe kidney;* and, occasionally, one kidney is altogether wanting. In such case, the other, having the whole of the urinary depuration to accomplish, is greatly hypertrophied.

When the kidney is divided longitudinally, it is found to consist of two substances—the *cortical* and the *tubular*, which differ in their situation, colour, consistence, and texture. The outermost is the part that secretes—the truly glandular portion of the organ; the other—the inner—is composed, as its name imports, of tubes, which convey the fluid secreted by the cortical part towards the hollow portion or pelvis of the kidney. The cortical substance is of a soft, glandular consistence, of a dusky red colour, and sends prolongations between the cones formed of the tubular substance. Careful examination exhibits numerous granulations, which are supposed to have similar functions with the granules of the liver. The tubular substance is of a rosy hue, inclining to grayish, and somewhat lighter than the cortical.

The kidney receives a large supply of blood by the renal or emulgent artery; its nerves are from the ganglionic.

The membranous duct, which commences at the pelvis of the kidney—*the ureter*—conveys the urine to the bladder. Its course must be borne in mind by the pathologist. It is about the size of a goose-quill; descends through the lumbar region, dips into the pelvis by crossing in front of the primitive iliac vessels and the internal iliac, crosses the vas deferens at the back of the bladder, and, penetrating that viscus obliquely, terminates by an orifice, ten or twelve lines behind that of the bladder. The ureters have two distinct coats,—an inner or mucous, and an outer or fibrous, which—like the second coat of the gall-ducts—is liable to spasm, or is manifestly contractile.

The position of the *bladder* must be recollected:—it is in the pelvis, anterior to the rectum, and behind the pubes. It has three coats—the peritoneal, which covers only the fundus and back part—the muscular and the mucous. The urine is retained in the bladder, as in a reservoir, until the desire arises for its expulsion, when it is expelled through the urethra.

In regard to many of the characters of healthy urine, much discrepancy exists amongst observers. These have been described elsewhere, (*Human Physiology*, 6th edit. ii. 320, Phil. 1846. See, also, Simon's *Animal Chemistry*, Sydenham Society edition, ii. 113; London, 1846.) It may be sufficient to remark here, that on many of the topics, which must be looked upon as points of departure for the pathologist, it is impossible to lay down any exact standard. This applies to the specific gravity, which has been estimated at from 1·001 to 1·060 by one observer, M. F. D'Arcet. The same discrepancy exists as to the quantity of urine passed in the twenty-four hours, which may perhaps, on the average, be estimated at two pounds and a half.

From the results of investigations, M. Simon concludes,—that the urine is most abundant in urea, uric acid, and the most important salts, in men in the prime of life: it is less rich in these constituents in women, whilst the minimum occurs in old men and children. In the treatment of diseases of the urinary organs, it is important to bear in mind the material modifications produced in the urine by different ingesta. Experiments instituted on himself by Dr. Lehmann of Leipzig, and referred to by the author in the work above cited, are in this relation full of interest. The results of these show, that an animal diet increases the solid matters in the urine, whilst a vegetable diet, and especially one consisting of non-azotized articles diminishes them,—and that the proportion of azote in urine depends in part upon the kind of food taken—food rich in azote greatly increasing it. In his experiments, the proportion of urea to the other solid matters was as 100 to 116 under a mixed diet; as 100 to 63 under an animal diet; as 100 to 156 under a vegetable diet; as 100 to 170 under a non-azotized diet;—that the proportion of uric acid in the urine did not appear to have reference to the kind of food;—that the urine contained quantities of sulphates and phosphates proportioned to the quantity of azotized matters that had been absorbed;—and that under an animal diet the quantity of extractive matters diminishes, whilst it is increased by the use of a vegetable diet.

The varying conditions of the urine, in different pathological states

of the urinary and other organs, are pointed out in the appropriate places. It may be well, however, to give in this place the following table, which was drawn up by Dr. Golding Bird, to enable the observer to distinguish between the substances that cause some of the various colours possessed by the urine in disease.

Colour.	Causes of Colour.	Chemical and Physical Characters.	Pathological Indications.
Red A.	Purpurine.	Nitric acid produces a deposit of uric acid almost immediately: no change by heat. Alcohol digested on the extract acquires a fine crimson colour. Density moderate.	Portal congestion: it is generally connected with organic mischief of liver or spleen.
B.	Blood.	Becomes turbid by heat and nitric acid; its colour changing to brown. The microscope discovers floating blood-discs.	Hemorrhage in some part of the urinary passages.
Brown C.	Concentration.	Nitric acid precipitates uric acid readily. Density high. The addition of chlorohydric acid to some of the urine previously warmed, produces a crimson colour.	
D.	Blood.	See B. Coagulation by heat and nitric acid less marked.	Obstruction to the escape of bile from the liver or gall-bladder;
E.	Bile.	A drop of nitric acid, allowed to fall on the centre of a thin layer of urine on a white plate, produces a transient play of colours, in which green and pink predominate.	and the presence of some or all the elements of bile in the circulation.
Greenish brown. F.	Blood.	See B.; occurring in alkaline urine.	
G.	Bile.	See E.; occurring in very acid urine.	
Grass green. H.	Excess of sulphur.	Unchanged by heat or nitric acid.	Presence of cystine.

For the following general results as to the urine in disease, we are indebted to M. Simon. The quantity of water in the urine varies in disease as it does in health, which may be the occasion of remarkable differences in its external physical characters in those who are suffering under the same disease, — a circumstance which, according to M. Simon, analysis enables us to trace to the different proportions of water that may be present. The quantity of fluid taken, and the amount of cutaneous and pulmonary transpiration, will of course affect the quantity of the watery constituent, and this has to be borne in mind in forming an opinion of the urine discharged, and its degree of concentration. The morning urine is more concentrated than that which is discharged during the day. In consequence of the fluctuations arising from various causes in the amount of water in healthy urine, M. Becquerel concludes, that its increase or diminution cannot be referred to the action of disease, except less than twenty-seven or more

than fifty-two ounces are discharged in twenty-four hours,—the average quantity in health being, in his opinion, about forty-four ounces in that period. The diseases in which the watery portion is absolutely or relatively increased are diabetes in its different forms, and certain hysterical or nervous disorders in which a limpid and thin urine is secreted in large quantity. The amount of water is diminished in inflammatory affections, in which M. Becquerel has known it fall as low as twelve ounces in the twenty-four hours. In such cases, it is of a very dark colour, of great specific gravity, and possesses a strong acid reaction. In the same diseases, the amount of urea was found by Nysten to be augmented, and the analyses of M. Simon, on the whole, tend to confirm this, as he found it either absolutely or relatively increased, or equal to the quantity separated in a healthy state, or at any rate but slightly diminished. It must be remembered, however—he remarks—that in these acute diseases only very small quantities of nitrogenized food are taken, and that the quantity of urea must naturally decrease under such a diet; and therefore we may regard it as increased even if it falls below the healthy average. The quantity of urea is diminished in diseases in which there is either an absolute deficiency of blood, or the blood is poor in corpuscles. M. Becquerel found the urine in chlorosis deficient in urea, and M. Simon discovered this to be the case in the latter stages of typhus. The relative proportion of uric or lithic acid varies greatly in different diseases. It is increased by disturbances in the circulating system—as in the paroxysms of fever, in the phlegmasiæ, &c. It is diminished where there is a deficiency of blood, or the blood is poor in corpuscles,—hence in chlorosis and anæmia. The amount of salts in the urine fluctuates greatly in disease; generally speaking it decreases in most morbid states of the system,—the cases in which the salts increase during disease being rare.

It has been well observed, by Dr. Marshall Hall, that it is interesting to remark the influence—*first*, of disease of one part of the urinary organs over the functions, and, ultimately, over the structure of others; *secondly*, of diseases of the spinal marrow over the secretion of the kidney; and *thirdly*, of affections of the urinary secretion over the state of the brain.

The mortality from diseases of the urinary organs, in the year 1839, throughout England and Wales, according to the report of the Registrar-General, was 1275 males, and 259 females; being a rate of mortality in 1,000,000 of 169 males, and 33 females.

SECTION I.

DISEASES OF THE KIDNEY.

I. INFLAMMATION OF THE KIDNEY.

Synon. Inflammatio Renum, Empresma Nephritis, Nephritis; *Fr.* Néphrite, Inflammation des Reins; *Ger.* Nierenentzündung, Entzündung der Nieren.

a. *Acute Inflammation o the Kidney.*

Synon. Nephritis acuta.

Diagnosis.—Inflammation of the kidney is known by loca lphenomena, both of an organic and functional character, and, likewise, by pheno-

mena exhibited sympathetically by other organs. A dull weight or pain is felt in one side of the lumbar region—when one kidney only is affected. This is sooner or later succeeded by an acute, pungent—at times lacerating—pain, which is deep-seated, and accompanied by a sensation of internal heat. The pain often extends from the loins to the ureters, bladder and testicle of the affected side, and often to the groin and thigh, where it occasions numbness or a peculiar tremulous motion. The testicle is also, at times, painfully drawn up towards the abdominal ring. The pain is increased by the act of breathing, and if the patient make a quick or false step, or experience any kind of shock; and by pressure and percussion. If he be in bed, the examination may be made by placing him upon his back, pressing the fingers between the short ribs and the ilium, the thumb being opposed to them on the corresponding part of the abdomen, or by causing him to lie upon his face, with the knees drawn up under the abdomen, and grasping the flank with one hand, or between both hands. In this manner, the kidney can be examined distinctly; and sensibility and tumefaction may, in general, be perceived. If the patient be not in bed, pain and tenderness can frequently be detected by percussion. The urine is generally, scanty and red, during the first days; and, at times, bloody; and when both kidneys are affected, it may be altogether suppressed. In other cases, it is watery, clear, and deposits a white, homogeneous sediment. When examined by M. Schönlein, it was found to be of a dark red or claret colour, and to contain hæmatin. According to M. Rayer, too, it contains a certain quantity of blood or albumen; and has an acid, a neutral, or even an alkaline reaction. It occasionally contains pus, as when an abscess communicates with the pelvis of the kidney, or when the nephritis is accompanied by inflammation of the mucous membrane of the urinary passages. In five cases examined by M. Becquerel, no blood was discoverable in the urine. Dr. Willis directs attention to the sediment in simple nephritis, which he says, distinguishes it from arthritic attacks:—it usually consists of an amorphous powder of phosphate of lime, with crystals of ammoniaco—magnesian phosphate (if the urine is neutral or alkaline) or of urates. If any crystals of uric acid are present, they are only in small quantity. The urine of gouty nephritis—*nephritis arthritica*—is described by M. Schönlein as being of a fiery red colour, very acid, and soon after being discharged depositing glistening red crystals of uric acid. In one instance, he found the sediment occupying half the volume of the urine. At times, the sediment is of a yellow colour, and occasionally there is gravel mixed with mucus and blood. If the disease terminates in convalescence,—according to M. Schönlein, either copious sediments of a sandy micaceous appearance present themselves, or gravel of varying size is discharged with the urine. But little, however, has been done in regard to the chemistry of the blood in renal diseases. M. Lauer found it, when taken from a man suffering under nephritis, and who speedily fell a victim to the disease, strongly resembling milk.

At times, the pain in nephritis intermits, or rather remits, to return again with perhaps increased violence. When this is the case, the

nephritis is probably caused by a renal calculus, a probability which amounts almost to certainty, if sand or gravel be discovered in the urine.

Along with these symptoms which are confined to the urinary apparatus, there is more or less febrile irritation, and, in almost all cases, the digestive apparatus greatly sympathizes; and the patient is affected with nausea and vomiting, which, by the way, attend almost all diseases of the kidneys, uneasy sensation in the abdomen, with much flatulence, and often diarrhœa.

Acute nephritis, when properly treated, usually terminates by resolution, in from one week to three. It may, however, end in suppuration—constituting the *pyonéphrite* of M. Piorry. In such case, the pain becomes dull and heavy; a sense of weight is felt in the loins; the pulse becomes full and soft; and alternate chills and heats are experienced, succeeded by sweats. If, along with these symptoms, the urine is lactescent, and pus is deposited at the bottom of the vessel, the diagnosis is unequivocal. The cellular membrane surrounding the kidney generally participates in the inflammation; and, frequently, the lumbar region becomes doughy and tumefied, followed by a distinct tumour, and deep-seated fluctuation. When the disease terminates by suppuration, a large abscess sometimes forms, and the kidney becomes entirely disorganized. It may, however, discharge itself into the colon, or into the cavity of the abdomen, or form an abscess in the groin or at the margin of the anus. Gangrene is a very uncommon termination.

Causes.—Nephritis may attack all ages; but it is more common in the adult than in infants and old people. Men are said to be more frequently attacked with it than women; but, on this point, we need more accurate statistical information. Persons, born of gouty parents, or who are gouty themselves, are more liable to it than others. Climate is said to exert some influence, and this is probable. In the colder regions, the cutaneous depuration is diminished, and the urinary increased; the kidneys have, consequently, their activity augmented: hence it might be presumed, that nephritis would be more apt to occur in cold, moist climates, and seasons. If to this be added the use of stimulating drinks, which are more common in the temperate and cold regions, we can readily understand, why nephritis should prevail to a greater extent than in the warmer. The most common exciting causes of nephritis are—*First*, such as act more immediately on the kidneys,—for example, blows on the lumbar region, and wounds received on that region, which implicate the kidney. It has, also, been ascribed to violent succussion—as dancing, riding on horseback, or in a carriage without springs on bad roads. This is the *nephritis traumatica* of the German writers. *Secondly*, substances, which when taken into the stomach, or received in any manner into the circulation, irritate the kidneys,—as cantharides, absorbed from the stomach or from a blistered surface,—oil of turpentine, oil of savine, and any stimulating diuretic. *Thirdly*, calculi in the kidney, especially such as are angular—*nephritis calculosa* of writers. *Fourthly*, it is occasionally witnessed precursory or succeeding to an attack of rheumatism or gout,—the *nephritis metas-*

tatica of writers; and *lastly*, the inflammation may extend from the bladder or urethra.

Pathological Characters.—Occasionally, the kidneys are found, on dissection, to be unusually dark, their structure gorged with blood, their vascularity increased, and at times there are evidences of extravasation of blood. Such may be the case in the prodromic stage of acute nephritis, of granular disease of the organ, &c.; yet the affection may be nothing more than *hyperæmia of the kidney*,—*néphrohémie* of Piorry. When the organ is inflamed, it is generally larger than natural; but, at times, it is small; and, at others, the size seems to be little—if at all—modified. It is of a red—sometimes violet—colour, and gorged with blood; or, it may be pale and exanguious. Generally, its tissue tears with facility; but, at times, it is harder than natural. Occasionally, small, purulent collections are found here and there in the parenchyma; and calculi are loose, or implanted in the substance of the organ, which their angular prominences have lacerated. If the inflammation have run very high, pus may be found collected in considerable abscesses, whence it may have passed into the calices and pelvis of the kidney. The ureters sometimes participate in the disease. In such case, they are injected, and their mucous coat thickened. When the injection affects one or other substance of the kidney, the appearances differ. If it be seated in the cortical part, the vessels form wreaths about the granulations; if in the tubular, the injection presents a striated appearance. When the inflammation is seated superficially, the affected parts can be distinguished by their deep colour, the arborescent arrangement of the capillaries, and the effusion of serous fluid beneath the fibrous envelope.

The disease is very rare in its acute form, and, consequently, not many opportunities occur for necroscopic examination. The simple idiopathic disease yields generally to appropriate treatment; but where it is intercurrent, or supervenes in the progress of urinary or other diseases, it is not favourable. M. Rayer, who considers some form of nephritis to be an exceedingly common disease, distinguishes four varieties, according to the parts of the kidney that are involved—1. *Nephritis*, when the gland itself is inflamed; 2. *Pyelitis*, when the pelvis and calices are the parts inflamed; 3. *Perinephritis*, when the inflammation is in the investing membrane; and 4. *Pyelonephritis*, when both the pelvis and the granular structure are involved.

Treatment.—Like every other active internal inflammation, acute nephritis requires the vigorous employment of antiphlogistics. At the commencement, it may be necessary to draw blood freely from the general system, until the activity of the circulation is greatly diminished: even should it require twenty to thirty ounces, or more, to produce the effect. In this way, the inflammation may be, at times, cut short. Should the first bleeding be inadequate, and the inflammation and strength of the patient permit, the bleeding may be repeated in the course of six or eight hours; and, again and again, under proper cautions. Along with general bleeding, and especially in cases where the practitioner may hesitate as to the farther use of the lancet, the inflammation still continuing,—cupping, not over but around the region

of the kidney, or the application of leeches, and when they fall off, of cups over the leech-bites, will be found beneficial. The warm bath, too, and emollient enemata, thrown up into the colon, act serviceably as fomentations. When the inflammation is reduced in this manner, revellents may be used—as the croton oil, or an ammoniated liniment over the region of the kidney; but blisters of cantharides and essential oils should be avoided, inasmuch as the cantharidin of the former, and the latter themselves, may pass into the mass of blood, proceed to the kidney, and excite irritation there. From the commencement, too, gentle laxatives of castor oil may be administered; but the saline cathartics, which act at the same time as diuretics, should be avoided.

A question has arisen amongst therapeutists, as to the propriety of allowing diluent drinks. It has been argued, that they should be taken sparingly, especially when both kidneys are inflamed, in order that the inflamed organs may have as little secretory labour as possible. It has been advised, indeed, that the patient should quench his thirst by small pieces of cold orange. On the other hand, it has been argued, that the free administration of mucilaginous drinks assist greatly in diminishing the inflammation, and that the less the quantity of urine, the more is it concentrated as a general rule, and, hence, the more irritating. Much, therefore, may be said on both sides; and, experience must pronounce definitively on the matter. The probability is, that either plan will answer, and that plain water is as beneficial as the mucilaginous drinks, that are almost universally prescribed in such cases, inasmuch as the mucilage undergoes digestion in the stomach and small intestines, and the water alone passes into the mass of blood to be separated by the kidneys. Should a renal abscess form in the lumbar region, it is important to open it, as soon as fluctuation is manifest. During the whole course of treatment, the patient should be kept at rest; and the warmth of bed is advisable. The diet, during convalescence, should consist chiefly of farinaceous aliments.

b. *Chronic Inflammation of the Kidney.*

Synon. Nephritis chronica, Chrono-néphrite. (*Piorry.*)

Chronic nephritis may originate spontaneously and simply, or it may be occasioned by calculus, or succeed acute nephritis.

Diagnosis.—The symptoms greatly resemble those of acute inflammation of the kidney, except that they are by no means as severe. Pain is experienced in the region of the loins and in the groin, which may, or may not, be accompanied by retraction of the testicle, numbness of the thigh, and discharge of high-coloured or bloody urine. These symptoms are continuous, and where there is suppuration—*Abscessus* seu *Helcosis renalis;* Ger. *Nierenverschwärung*—they gradually affect the constitution materially, as indicated by hectic fever, and progressive emaciation, which may finally end in death, *Nephrophthisis*, Ger. *Nierenschwärsucht.*

In some of the cases of chronic nephritis, great obscurity exists in the diagnosis, inasmuch as the uneasiness is often mainly referred to the bladder, which may, notwithstanding, be healthy, yet so sympathetically irritated, that the patient may be compelled to pass his urine

every ten or fifteen minutes; and cases have occurred in which the operation of sounding has been practised over and over again, for a disease which was really seated in the kidney. An interesting case of this kind will be referred to presently.

Pathological Characters.—These are much the same as in acute nephritis. In this form of the disease, extensive abscesses frequently occur, which destroy, at times, the whole parenchyma of the organ; breaking into the colon, or into the cavity of the peritoneum.

Treatment.—This must rest on the principles laid down under acute inflammation of the kidney. It will rarely, however, be necessary to employ general bloodletting. Cupping—not immediately over, but around—the region of the affected kidney, followed up by revellents, —as dry cups; frictions with the oleum tiglii or the ointment of tartarized antimony; mucilaginous diluents; farinaceous aliments; and oleaginous laxatives, will constitute the treatment.

When the affection is dependent upon renal calculi, it will require the treatment to be described hereafter.

II. HYPERTROPHY AND ATROPHY OF THE KIDNEY.

Synon. *Fr.* Hypertrophie et Atrophie des Reins; *Ger.* Nierenatrophie.

These conditions are more interesting to the pathologist than to the therapeutist. Hypertrophy — *Hypernéphrotrophie*, of Piorry — may affect one or both kidneys: commonly, however, it is met with only in cases in which one kidney only has existed; or where some cause has occasioned atrophy of the other. Atrophy of the kidney may be congenital, or it may result from compression exerted by a tumour. Atrophy of the cortical substance may be induced by any cause that mechanically obstructs the flow of urine. In such case, the urine, not being able to escape, presses upon the pelvis and infundibula, and produces dilatation, and a surprising expansion of the cortical substance, which gradually spreads into a thin membranous sac. It occasionally happens that—when the kidney has been, for some time, expanded into a sac of this nature, owing to a calculus obstructing the pelvis of the organ, and the calculus is not dislodged—after a time the urine which distends the kidney is absorbed; the membranous sac at the same time wastes, and shrinks, and is finally reduced to a mere capsule containing the stone.

III. SEROUS CYSTS, AND HYDATIDS IN THE KIDNEY.

Synon. *Fr.* Kystes et Hydatides des Reins.

These are not uncommonly met with, especially some of a small size, which contain a transparent fluid. Their increase is supposed to be slow, and they generally induce but little irritation of the organ. At times, they are large enough to form a tumour, which presses upon the kidney, and occasions its atrophy. Many cases of extensive renal cysts are on record. They are extremely common in the hog, and have been well described by Dr. Gross, who, from his former position at Cincinnati, had ample opportunities for observation.

If the tube of one of the papillæ be obstructed from any cause, it may become expanded into a cyst of considerable size, which is filled

with urine. To this condition the terms *Hydronéphrose* and *Hydrorénale distension* have been given by M. Rayer.

In cysts or hydronephrosis confined to one of the kidneys, the patient has experienced more or less acute pain in the corresponding lumbar region; and at the end of more or less time, an irregular tumour, dull on percussion, has been distinguishable, the size of which, appreciable by palpation and percussion, may vary from that of the fist of the individual, to that acquired by the uterus in the last months of utero-gestation.

Treatment.—It has been advised by M. König, that hydrorenal tumours should be punctured whenever they are sensibly elevated, and present fluctuation; but M. Rayer properly objects to this course, and affirms, that when the disease is simple it does not threaten life, and is, indeed, compatible with a state of perfect health; whilst, in consequence of puncturing, the sac has inflamed, and the patient been carried off by peritonitis.

To the head of serous cysts may be conveniently referred *hydatids*. Of these, the author met with an interesting example, which was complicated with extensive disease of the kidney of other kinds. The case was highly illustrative of the great irritation referred to the bladder, which is often induced by renal disease, when that viscus may, notwithstanding, be entirely healthy: with this view, he has referred to it elsewhere, (*General Therapeutics*, p. 305,) but it cannot be passed over here. A gentleman—himself a respectable member of the profession, in the service of his country—had long suffered under distressing irritability of the bladder, with occasional pain in the region of the kidneys, and, in one or two instances, with severe nephritic symptoms, which yielded to appropriate measures. A tumour gradually arose in the right lumbar region, which could be distinctly felt on pressing the corresponding part of the abdomen, but its connexion was so obscurely defined, as to occasion great doubts, as to its character, in the minds of many intelligent practitioners whom he had consulted. By most, indeed, the irritability of the bladder was supposed to be unconnected with the tumour, and the mischief was presumed to be vesical rather than renal. He had been several times sounded, but no calculus was found in the bladder. When Dr. Gibson, of Baltimore, and the author saw him together, he was passing a large quantity of albumen with his urine, which coagulated when heated to the necessary degree. This, along with the other phenomena, led to the belief, that the disease was in the *secreting*, and not in the *retaining* organ; and they felt satisfied, that the tumour belonged to, or was connected with, the right kidney. Under these views, he was put upon a palliative treatment,—everything being carefully prohibited, that could irritate the kidney. He was advised to try the revulsive influence of change of air, with which object he visited the trans-Alleghany region of Virginia, but the effects of organic irritation developed themselves with greater and greater intensity, so as to induce him to return to Georgetown, where he expired under symptoms of gastric and cerebral derangement; but no hydropic effusion super-

vened, as there was reason to anticipate, and as indeed might have happened, if his malady had been longer protracted. On dissection—as the author was informed—the tumour was found to be the right kidney extensively diseased, and containing a multitude of hydatids. The left kidney, too, was in a morbid condition, and had calculi imbedded in it; but the bladder, although contracted, was healthy; the whole of the distressing irritation in that organ—which prevented the patient from remaining, for the latter part of his existence, more than 15 or 20 minutes undisturbed in bed—being symptomatic of the renal mischief.

Like hydatids or acephalocysts found elsewhere, those of the kidney have a firm coat, composed of different layers, and have numbers of smaller hydatids within them, which are thrown off from the interior of the parent cyst; hence the name *Acephalocystis endogena*, which has been given to this species, to distinguish it from the *Acephalocystis exogena* of ruminant animals, in which the young vesicles are developed from the exterior of the parent vesicle. These hydatids vary in size, from that of a hemp-seed to that of an orange; and they are occasionally discharged with the urine,—which circumstance affords the only clear evidence of their existence during life.

IV. TUBERCLES OF THE KIDNEY.

Synon. Tubercula renum; *Fr.* Tubercules des Reins; *Ger.* Tuberkeln der Nieren.

Tubercles of the kidney rarely occur, except in connexion with tuberculosis of other organs, and are often absent when the tuberculous diathesis is most marked. A case, indeed, has been published by Professor Gross, in which they existed in great numbers without any being present in the lungs, but, from the history, doubts may be entertained, whether they were true tubercles. "In the right kidney," says Dr. Gross, "of a young man of twenty-seven, who died last summer of psoas abscess, in the Cincinnati Hospital, there were upwards of five hundred in the cortical substance, of all sizes between that of a mustard-seed and a cherry-stone. In some parts, they were agglomerated; in others, isolated. They were of a white opaque appearance, semi-cartilaginous in their consistence, and evidently organized,—since, in cutting through some of them, I could distinctly trace the existence of vessels, the blood standing upon the incised surface in minute dots. Externally, the organ had a dark mottled aspect, and, in its interior, were two tubercular excavations; one, situated in the superior extremity of the gland, was scarcely larger than a hazel-nut; the other, which occupied the lower half of the viscus, was about the size of a turkey's egg, and filled with thin, ropy, whitish pus, destitute of smell. The abscess was lined throughout by a thick layer of lymph; and, intersecting it in different directions, were four rounded cords, the remains, probably, of the tubular texture, which resembled a good deal the fleshy columns of the heart, or the bands which we so often see in tubercular excavations of the lungs. The kidney was very little enlarged, and some tubercular matter was also found in the excretory passages, the cavity of the ureter having been nearly obliterated by it. In this case, not a tubercle could be detected in the lungs. They were,

indeed, perfectly sound, as were also the heart and brain, together with most of the abdominal viscera. Strumous matter was abundantly contained in the lymphatic ganglions of the pelvis, and the seminal vesicles were completely distended with it."

The existence of tubercles in the kidney can, of course, only be suspected by the general signs of tuberculosis along with renal irritation. The tubercular matter is found, at times, deposited in spherical masses, in the cortical substance of the kidney; at others, it is said to have been seen lining, as an exudation, the mucous surface of the infundibula, pelvis, and ureter, and to be commonly combined with dilatation of the cavities of the kidney, and expansion of its cortical substance.

V. CANCER OF THE KIDNEY.

Synon. Cancer Renum, Carcinoma of the Kidney; *Fr.* Cancér des Reins; *Ger.* Nierenkrebs, Krebs der Nieren.

This is a rare affection, and cannot readily be mistaken. It generally —perhaps always—occurs along with other signs of the cancerous diathesis. The tumefaction can be perceived, at times, during life, and usually there is more or less renal irritation, with hæmaturia.

In *encephalosis* or *encephaloid disease of the kidney*, the whole organ is transformed, at times, into a soft pulpy mass, of the colour and consistence of brain. The diseased mass has been known in one instance to weigh nearly twelve pounds. In that case, observed by Mr. Langstaff, the tumour was irregularly lobulated, and, on cutting into it, a large clot of blood was found, arranged in loose, concentric layers, as in a rapidly formed aneurism. Often, in such cases, there is great pain and irritation in the kidney and bladder, and sympathetically in other organs: yet in some, even when the tumour is very large, there may be a total absence of all symptoms—direct and indirect—which could have caused a suspicion of renal mischief. Still, we should expect, that the countenance would generally exhibit the striking expression, which internal malignant disease so usually gives rise to.

Melanosis of the Kidney has been observed, but never except when the lesion existed in other organs.

VI. ENTOZOA IN THE KIDNEY.

Synon. *Fr.* Entozoaires des Reins; *Ger.* Nierenentozoen.

The presence of entozoa in the urinary organs of man is not common. They are very often met with, however, in the inferior animals,—exceedingly so, we are told, by Professor Gross, in the hogs that are taken to the slaughter-houses in the environs of Cincinnati. Of the acephalocyst, as a parasite of the liver, mention has already been made.

The most common worm—indeed, almost the only one—discharged from the urinary organs, is the *strongylus*, which is met with, on dissection, in the pelvis and infundibula of the kidney, in which it is frequently coiled up in considerable numbers. Occasionally, it would appear to make its way into the parenchymatous structure, where it gives rise to suppuration, atrophy, or other mischief. A collection of these worms was presented to the Pathological Society of Philadelphia

by Professor Horner, which had been discharged from the urethra of a man in the state of North Carolina. They were twelve to fourteen in number, and about ten or twelve lines long, and one line in diameter. They were discharged periodically; and their exit was preceded by much suffering. Of late, another species of worm has been discovered in the urine, to which the name *Dactylius* has been given by Mr. Curling; and in a single case, observed by Mr. Lawrence, the *Diplosoma crenata* and the *Spiroptera hominis* were discharged from the bladder of a female. This is the only recorded instance of either of these entozoa having been met with in man.

Should the presence of entozoa be suspected by the discharge of one or more, the others might, perhaps, be dislodged by the animal oil of Dippel, or congenerous substances, which pass into the circulation, and are separated by the kidney. The *oleum terebinthinæ* might be very efficacious in such cases.

VII. GRANULAR DISEASE OF THE KIDNEY.

Synon. Morbus Brightii, Nephritis albuminosa, N. albuminensis, Urozemia albuminosa, Disease of Bright, Bright's Disease, Granular Degeneration or Disorganization of the Kidney; Serous urine (*Prout*); *Fr.* Maladie de Bright, État granuleux ou Dégénerescence granulée du Rein, Albuminurie, Albuminurorrhée (*Piorry*); *Ger.* Bright'sche Krankheit, Eiweisshaltige Harnfluss, Granulöse Degeneration der Nieren.

Although this lesion, and its connexion with dropsy, were not first suspected by Dr. Bright, the disease cannot be said to have been received amongst the *fasti* of medical science, until the year 1827, when Dr. Bright, in his *Reports of Medical Cases*, affirmed, that dropsy frequently depends upon a peculiar degeneration of the structure of the kidneys, and that this change of structure is likewise attended by a liability to other diseases, of an inflammatory character more especially, and is indicated by *albuminuria*, or the presence of albumen in the urinary secretion. "It was afterwards found,"—says a writer on this disease, Dr. Christison,—"as in regard to many other important discoveries in pathology, that various authors had previously made observations, which, if followed out, might have led them to the general principles established by Dr. Bright. Among these, the names of Dr. Blackall, Dr. Alison, Professor Andral, and especially of Dr. Wells, may be deservedly mentioned. It is not, however, by a few fortuitous observations, and, still less, by obscure and incomplete inductions, that the merit of an original discoverer in medical science is to be either gained on the one hand, or lost on the other. Formerly, physicians were in possession of only a few scattered facts and dubious inferences, respecting the connexion between dropsy and diseased kidney, and these were almost disregarded, alike in science and in practice. Now, they may become intimately acquainted with a disease of extreme frequency, which manifests itself by characteristic symptoms, and singularly modifies and engenders a great variety of other long-familiar maladies. For this important step in the progress of knowledge, medicine is indebted to Dr. Bright,—together with those inquirers, whom his discovery has called forth, to explore with more minuteness the regions he has pointed out."

Diagnosis.—The symptoms of granular disease of the kidney have

been arranged under the following heads;—pain and other local uneasiness; disordered digestion; diseased state of the urinary secretion; derangement of the general circulation, together with an altered condition of the blood; leucophlegmatia; and a variety of secondary or incidental affections of textures and organs at a distance from the primary seat of disease, amongst which the most frequent are;—œdematous effusion into the cellular tissue, serous effusion into the serous sacs, inflammation of the serous membranes, bronchitis, diarrhœa, rheumatism and affections of the brain. These symptoms are variously grouped in particular cases, arising, in part, from the disease being, at times, acute; at others, chronic; and, in part, from the great number and complexity of the secondary disorders.

In the *acute form* of the disease, along with general symptoms of pyrexia, the urine may be very scanty, and at times altogether suppressed. That which is discharged is, however, highly albuminous, and, occasionally, although rarely, mixed with blood. There is, along with these symptoms, often an uneasy feeling, and, at times, positive pain in the region of the kidney, with great irritation about the bladder, so as to lead to the belief, that the mischief is vesical rather than renal. This pain may be augmented, on pressure or percussion being exerted over the region of the kidney. As in other affections of the kidney, the stomach and bowels usually sympathize, so that nausea and vomiting are of common occurrence, with more or less derangement of the intestinal functions. These symptoms do not continue many days without the secondary affections of dropsy, especially of the limbs and face, coma, with or without convulsions, and acute serous inflammations, more especially pleurisy. Dropsical effusion is seldom long absent, and, when it occurs, it assumes the character of inflammatory or active dropsy. This form of the disease may prove fatal in a few days, or it may be checked by appropriate active treatment, but, what is more likely, the active symptoms may pass away, and those of the chronic state take their place.

The *chronic form* may be such from the onset, but it may also be the sequel of the acute form. The disease may be proceeding on obscurely, and may be indicated by little more than gradually increasing debility, with great paleness and other signs of ill health, and no suspicion may prevail that the kidneys are affected, until the occurrence of some secondary disorder may unequivocally announce the existence of renal mischief. When the patient is then interrogated, he may reply, that he has experienced more or less irritation—at times very trivial—about the urinary apparatus, which may have required him to rise from bed once, twice, or oftener during the night, to empty the bladder. This condition may endure for a long period,—for even years; or, accidental circumstances may light up the acuter symptoms already described, or give rise to some of the secondary disorders. The essential disease is, however, considered to be distinguished by the following indications:—reduction of strength; emaciation, not always, however, considerable; remarkable uniformity of the complexion; and, commonly, great paleness; or, on the other hand, at times, a peculiar pale brownish dinginess of colour; defective transpi-

ration, as indicated by dry skin, and want of perspiration under exercise; often, a tendency to drowsiness; frequently, too, weakness of digestion, or even well-marked dyspepsia, not unusually attended with sickness, or retching, in the morning, on awaking from sleep; thirst, —together with an important pathological condition both of the urine and of the blood, and, sometimes, more or less irritation about the urinary organs. Of these symptoms, none would seem to be invariable, except the altered condition of the urine and blood, with perhaps also the unhealthy complexion. On the last symptom, however obviously not much reliance can be placed, but the two former are pathognomonic.

In the early period of the disease, the urine is generally greatly diminished in quantity; and, at times, nearly or altogether suppressed. The last symptom is a serious one, and is usually followed by fatal encephalic disease. Mr. Toynbee affirms, that most important evidence of the approach and presence of the renal disease may often be derived from a microscopical examination of the urine, in which will be found fat in unusual quantity; partly in the form of free oil globules, and partly contained in epithelial cells, which have escaped from the urinary tubes. When the urine is very small in quantity, it is generally very high-coloured, and bloody. Most commonly, however, its appearance is healthy; and, at times, a sediment forms as it cools, which is generally lithic acid or lithate of ammonia. Occasionally, a phosphatic sediment has been observed; but this is rare, except as the result of the alkaline condition, induced by long standing, and consequent decomposition. Cylinders or tortuous threadlike bodies have been observed in the urine by MM. Vogel, Scherer, Simon, and others. These, according to MM. Henle and Remak, are coagula of fibrin moulded to the uriniferous ducts—the granular appearance of the cylinders being, according to the latter, owing to the presence of lithate of ammonia; and he regards these of great importance in enabling an early diagnosis to be made. By this means, he has, on more than one occasion, determined the nature of the disease several weeks before the first appearance of albumen in the urine. M. Schlossberger, however, considers it to be very doubtful whether they can be esteemed diagnostic, as they will most probably be found in every primary or secondary nephritis in which fibrinous matter has been poured out into the tubuli uriniferi. They have been discovered by MM. Lehmann and Scherer in the urine of scarlatina. Generally, the urine froths more than usual when shaken; and, on blowing into it through a tube, bubbles are formed as in soapy water. This property is confined, however, to urine that is loaded with albumen. At this stage of the disease, the specific gravity does not differ much from the natural standard. It is usually from 1·021 to 1·028—the average specific gravity of healthy urine, according to Dr. Christison, being 1·024 or 1·025. It is very seldom so low as 1·016, unless where its quantity is greater than natural; and it can be understood, that where this is the case, the specific gravity will usually be less. At this stage, therefore, if we admit, that there is a reduction of density, it is to a slight extent only; but, at the same time, the urine, on the application of the appro-

priate tests, to be described presently, exhibits, that it contains a large quantity of albumen, and, along with this, an unusually small quantity of its solid ingredients; for, although the density of the fluid may be as high as 1·020 or even 1·024, this is partly owing to the albumen, which is a foreign component; and when the fluid is filtered after the coagulation of the albumen, the specific gravity, according to Dr. Christison, is found to fall four, five, or even seven units.

When the disease is greatly advanced, the quantity of urine is often but little less than in health; and, at times, far exceeds the healthy standard. Its appearance is much the same as in the early stages; and the same kinds of sabulous deposits may be met with. The density is, at this period, invariably much reduced. As the granular deposition proceeds, the density falls from the normal point, before mentioned, to 1·016, 1·014, 1·012; and in the advanced stage, it is commonly as low as 1·010, 1·008, or 1·007, even when the quantity secreted is rather under than over the healthy standard. The lowest density, ever noticed by Dr. Christison, when the quantity was not in excess, was 1·004. A density of 1·003 was once met with, by M. Martin-Solon, but the quantity of urine discharged was 44 ounces. It need hardly be said, however, that, owing to the varying specific gravity of the urine in health, it is difficult to deduce any exact inferences from it. (See page 678, of this volume, and the author's *Human Physiology*, 6th edit., ii., 320, Philada. 1846.)

The most remarkable property of the urine throughout the disease is its coagulability under the action of heat and nitric acid, owing to the presence of albumen. By the generality of chemists, it is not admitted, that healthy urine contains any albumen; but, in particular disordered conditions of the frame, mentioned elsewhere, and especially in the disease now under consideration, the quantity of albuminous impregnation is, at times, very great. The presence of albumen may be detected by various chemical tests; but the combination of coagulability by heat and by nitric acid affords decisive evidence. The sources of fallacy, at least, are so few, that little or no doubt can exist, after the fluid has been subjected to their action. At a temperature between 160° and 170° of Fahrenheit, the urine becomes turbid, and complete coagulation of the albumen is observed to take place. If any deposition of lithic acid, or of lithate of ammonia, exist in the cold urine, it is dissolved; and the urine, as it becomes warm, becomes likewise clear. Should the urine be turbid from mucus, it does not become clear in this manner: in such case, the fluid may be filtered before testing it farther. When the quantity of albumen is considerable, the urine will sometimes form a gelatinous mass: at others, it is like custard; and at others, again, it is merely rendered flaky. Yet even when it is present in largest amount, the proportionate weight of albumen to the urine is very trifling. Ten parts by weight in a thousand will render it almost a uniform pulp when heated. A writer in the *British and Foreign Medical Review*, for July, 1839, has affirmed, that the combination of three characters is necessary to afford incontestable evidence of the presence of albumen;—coagulability by heat and by nitric acid, and non-precipitation by acetic acid. If urine

contain milk or casein, naturally or by artificial introduction, it will coagulate by heat, and afford a precipitate when nitric acid is added; but, unlike albuminous urine, it will coagulate on the addition of acetic acid. When albuminous urine, again, is alkaline—for example, after long standing—it does not ordinarily lose its transparency when heat is applied, unless the quantity of albumen be considerable; and even in this case it assumes only a milky hue. The addition, however, of a certain quantity of nitric acid will cause instantaneous coagulation; and if sufficient nitric acid be added to neutralize the alkalies, the urine may then coagulate by heat.

When heat is used as a test for albumen, an error may arise from the appearance of a precipitate due to the presence of earthy phosphates. According to Dr. George Rees, the frequency of such an occurrence is greater than might have been anticipated, amounting to not less than 7 per cent. in 482 cases taken promiscuously from the hospital wards. Hence, an important error might be committed, in endeavouring to ascertain the comparative frequency of albuminous urine, if heat only were employed as the test. On the other hand, precipitation by nitric acid alone will not establish, that the matter thrown down consists of albumen. It may, indeed, be composed of lithic acid or lithate of ammonia. This is said to be a source of very common error. The precipitate of lithic acid or the lithates is, however, redissolved by an elevation of temperature, whilst albumen remains insoluble.

Along with the albuminous condition of the urine, a material change is observed in the condition of the blood in the disease under consideration. The most remarkable is a great decrease in the density of the serum, along with a corresponding reduction of its solid contents. This seems to be an invariable character in the early stage; and, with certain exceptions, to be peculiar to that stage. The average specific gravity of the serum, in health, may be estimated at about 1·027; whilst, in granular disease of the kidneys, it rarely exceeds 1·022; and the solid contents are reduced from 100 or 102 in 1000, to 68 and even to 61. It is proper, however, to remark, that great discrepancy exists among observers, as to the density of the serum of the blood in health. (*Human Physiology*, edit. cit. ii. 107.) Moreover, Andral remarks, that the diminished specific gravity of the serum is not an accurate criterion of the disease, since, if there be a diminished amount of corpuscles—which not unfrequently happens—the proportion of water in the whole will be increased, and the specific gravity of the serum be thus lowered, without any change in its proper quantity of solid matter. According to M. Andral, the diminution in the amount of albumen in the serum is exactly proportional to the quantity contained in the urine.

The serum in this disease is farther characterized by the presence of a large quantity of urea, which can be detected at all periods, but more especially in the early stages. In these stages, too, there would appear to be a frequent increase of the fibrin of the blood, without the proportion of the hæmatosin being affected, whilst in the advanced stages, the proportion of hæmatosin seems to be always greatly re-

duced—no other morbid change being invariably occasioned: frequently, however, the solid contents of the serum are likewise defective, whilst they are sometimes, on the contrary, in excess, and not unusually—especially if the disorder be far advanced—the serum contains urea likewise.

It has been remarked, that one of the evidences of granular degeneration of the kidneys is coagulability of the urine on the application of appropriate reagents; and by many it has been presumed, that the presence of albumen is always associated with positive disease in those organs. The fact, that dropsy is accompanied by albuminous urine has been long known, and was, at one time, ascribed to a general inflammatory state of the system, or to some distinct local inflammation demanding antiphlogistic measures. This view has undergone a mutation of late years, and the albuminous secretion is now ascribed to inflammation, or to decided organic derangement of the kidney. Observation has, however, sufficiently shown, that the urine may contain albumen without the kidneys being thus diseased. It has been denied, indeed, by Dr. Graves, that the albuminous state of the urine, in dropsies, always, or even generally, depends on structural change in the kidneys. Dr. Graves remarks, that he has seen so many cases in which the albuminous state of the urine entirely and speedily disappeared under the influence of proper treatment, that the only inference he could draw was, that this state frequently depends on mere functional derangement of the secreting organ. He was even led to prescribe opium and animal diet in some cases of dropsical effusion with albuminous urine, with the very best effects. Some years ago, the author was induced to draw extremely unfavourable inferences as to the result of a case of anasarca, with some degree of ascites, on account of the copious secretion of albumen by the kidneys; yet, under appropriate management, the dropsy disappeared, and along with it the albumen in the urine, and the individual had no return of the dropsy, but died two years afterwards of an encephalic affection. The kidneys were found to be distinctly granular.

Certain medicines—as mercury, and excitant and saline medicines—are said by some to have induced this condition of the urinary secretion. The observations of Dr. George Rees show, however, that the urine does not always become albuminous during salivation, as had been supposed, as in fifteen cases in which the urine was tested during salivation no albumen was found in it. The experience, indeed, of many eminent practitioners, by no means countenances the idea, that structural derangement of the kidneys is always present in albuminuria. Dr. Geo. Robinson, of Newcastle-upon-Tyne, is of opinion, that the presence of albumen in it is produced by, and its proportional quantity is in a direct ratio with, the degree of congestion of the capillaries of the kidney, from whatever cause the congestion may arise. He tied the renal vein on rabbits, and found that the secretion of urine of a highly albuminous character was the result. M. Martin-Solon presumes, that a connexion exists between the appearance of albumen in the urine, and the establishment of a favourable crisis in acute febrile, and inflammatory diseases. He found, that in some cases the urine

coagulated both by heat and nitric acid;—precisely as in granular disease of the kidney; whilst, in other cases, it appeared to coagulate by nitric acid and not by heat, the precipitate redissolving during ebullition. In the first cases, the coagulum was no doubt formed of albumen; in the latter, the precipitate consisted of lithate of ammonia. This, indeed, was farther proved by examination with the microscope, by M. Donné, who has employed this instrument successfully, to discriminate the presence of salts, or pus, or blood in the urine.

Diseases.	Number of Cases.	Coagulability.					
		Not produced by any reagent. A.		Produced by Heat. B.		Produced by Nitric Acid. C.	
		Recovered.	Died.	Recovered.	Died.	Recovered.	Died.
Intermittent Fever.	8	1	0	2	0	5	0
Measles.	7	2	0	1	0	4	0
Variola.	11	6	0	1	0	4	0
Scarlatina.	3	1	0	1	0	1	0
Pemphigus.	1	0	0	0	0	1	0
Typhoid Fever.	23	3	1	3	1	15	0
Bronchitis.	1	0	0	0	0	1	0
Pleuropneumonia.	24	2	0	2	0	17	3
	78	15	1	10	1	48	3

These facts are obviously opposed to the prevalent view, that albuminuria is diagnostic of the disease of the kidney, which is now under consideration. To arrive at still more satisfactory information on this matter, the author instituted experiments on the urine of different patients in one of the wards of the Philadelphia Hospital. These were examined, at his request, by Dr. M'Kee, of North Carolina, at the time resident physician of the ward. Eleven cases were observed: of them, 2 laboured under dysentery; 2 under bronchitis; 2 under phthisis pulmonalis; 2 under pleuritis; 1 under ascites; 1 under hypertrophy of the heart; and 1 under purpura. Each individual's urine was tested separately, and but two found to produce a coagulum by heat, and an albuminous precipitate with nitric acid. These were cases of dysentery. In both, the quantity of albumen was considerable; but in neither case was there the least reason to suspect renal disease. Since these examinations were instituted, (*American Medical Intelligencer*, July 1, 1839, p. 97,) some remarks have been made on the uncertainty of the diagnostic signs of albuminuria, by M. Toulmouche. He details two cases of albuminous urine. In both, the lining membrane of the bowels was affected: in the one, there was chronic enteritis with ulceration; and in the other, ulcerations and tubercles in the jejunum and ileum, with larger ulcerations in the cæcum and colon. In the latter patient, however, there were, also, the first signs of granular degeneration of the kidneys. Cases too have been published by Dr. C. Haller, of Vienna, and by Dr. Graves, of Dublin, in which, on the one hand, Bright's disease existed without albuminous urine; and, on the other hand, albuminous urine was present without Bright's disease.

It is evident, then, from all that has been said, that we cannot with

certainty infer the existence of any particular organic disease of the kidney, from the presence of albumen in the urine.

Dr. Bright estimated the number of persons affected with the disease to be at least one in six, if not in four, of those suffering sufficiently to keep their beds. This result he obtained by boiling the urine of all the patients in an hospital indiscriminately, and erroneously inferring, that albuminous urine is pathognomonic of the disease. According to a recent observer—M. Becquerel—of 1448 patients admitted into the Hôpital de la Charité of Paris during the year 1839, 3 had pneumonia; 28 pleurisy; 66 continued fever; 38 disease of the heart, and 17 the disease now under consideration, and Dr. C. J. B. Williams, of London, has stated, that a change of structure, the extreme of which constitutes Bright's disease, is, in slight degrees, exhibited in a large majority of the kidneys of adults examined in hospitals.

Causes.—The causes of granular derangement of the kidneys—as of every chronic ailment—are necessarily obscure. In the darkness of the subject, exposure to cold is generally invoked. Dr. Osborne refers 22 out of 36 cases, to suppressed perspiration from such exposure, and it would appear, from certain experiments on animals by M. Fourcault, that where cutaneous transpiration is entirely suppressed, albuminuria is one of the consequences: it has been remarked, too, by Dr. Christison, that when cold was not the apparent cause, he has never met with an instance where the patient could ascribe his illness to anything else. In four of the cases, however, which came under the notice of another observer, M. Martin-Solon, the cause to which the patient referred his complaint was a blow on the loins. A large proportion of cases would appear to have occurred in habitual drunkards, or in those who have indulged freely in ardent spirits. It has been estimated, that as many as three-fourths, or even four-fifths, of the whole number of cases, are referable to one variety or other of intemperance. The disease occurs, however, in individuals of entirely temperate habits, and, consequently, other causes than the irritation of excitants on the kidneys are capable of inducing it. Where it is met with in those of regular habits, characteristic evidences have generally existed of their being of the strumous constitution. Dr. Christison has, indeed, been disposed to suspect the strumous diathesis to be the prime and only essential condition, and intemperance to be no more than an accessory predisposing cause in any case. It certainly would appear, that the disease is, in no circumstances, developed with greater certainty than where habits of intemperance have been engrafted upon a strumous taint of the constitution. Great discrepancy has, however, existed in regard to the connexion between scrophulosis or tuberculosis and this affection. Most observers agree with Dr. Christison, whilst Dr. Bright affirms, that "the instances in which phthisis, or any form of scrofulous disease has been connected with the renal affection have been decidedly rare, so that in only four cases has recent phthisis developed itself:"—"and what," he adds, "is somewhat remarkable, in more than double that number, the disease seems to have made a certain inroad upon the upper lobes of the lungs, and then to have become quiescent, or to have entirely subsided, from which we should perhaps be

inclined to infer, that so far from the diseases being associated, the condition of body in this form of renal disease, is unfavourable to the existence of phthisis, or certainly that it is not peculiarly apt to occur in scrofulous constitutions." In consequence of the discrepancy amongst observers, Dr. T. B. Peacock carefully investigated the whole matter, and discovered, that in 117 cases of decided granular disease of the kidneys, extensive tuberculous affections of the lungs existed in 26, and a smaller number of tubercles, of recent origin, in 10 others; —that is, in 117 cases, 36—upwards of 30 per cent—contained more or less extensive advanced tuberculous deposition in the lungs. On analyzing the cases to discover the ratio of other affections of the lungs, and of disease of the heart and liver, he arrived at the following results:—

The heart was examined in 102 cases, and found diseased in 37 or 36·4 per cent.											
The liver	"	"	"	"	99	"	"	"	"	"	36 or 36·6 " "
The lungs	"	"	"	"	117	"	"	"	"	"	84 or 7·18 " "
											Phthisical in 36 or 30·7

In other words, the diseases of the heart and liver were of equal frequency, and occurred in about one-third of the cases; whilst the lungs were affected in different ways in two-thirds of the cases, and were tuberculous in nearly one-half of these;—whence Dr. Peacock infers, that the causes predisposing to the renal and pulmonary affections must be closely allied; and it would appear from the observations of many pathologists, that the pulmonary usually precedes the renal.

It would seem that the most active causes of granular disease of the kidney are of an essentially debilitating character. It is said, indeed, to have been artificially produced in the lower animals by Mr. Simon, of King's College, London, and Dr. Johnson, by a continued exposure of them to depressing influences.

In scarlatina, where albuminuria exists, the kidney may not always be diseased, and the albuminous secretion disappears as recovery takes place.

In those who are predisposed to the disease, it would seem that mercury, cantharides, and other excitants of the kidneys, may act as occasional causes; but whether they can induce the disease in the absence of such predisposition demands farther investigation.

Sex certainly appears to afford a predisposition, males being more liable to the disease than females,—some say in the ratio of *three* to *one*, but this, it has been imagined, is owing to the constitutions of the former being more undermined by intemperance, and to their being more subjected to cold with atmospheric vicissitudes. Age, also, affords a predisposition, and, it has been imagined, upon similar grounds. The disease now under consideration is most frequent between thirty and fifty, and so is intemperance. At the same time, it has been met with at ages when intemperance was out of the question; for example, at five years, and between that and ten; in some cases as a sequel of scarlatina; and an unequivocal case has been seen, according to M. Martin-Solon, in an infant of eighteen months.

With regard to the prognosis, it of course varies according to the degree of granular disorganization, and this is pretty well measured by the density of the urine: when it is very low, the organic mischief is, of course, great. At the same time it will have been understood from what has been said, that albuminuria may exist without serious mischief of the kidney, and may be merely an index of a favourable change occurring in some acute malady. Where the kidney is really diseased to a great extent, the prognosis must be very unfavourable. Sooner or later, it is sure to induce serious secondary disorder. In fact, the disease of the kidneys rarely ends fatally, except through the intervention of some other malady. The most serious secondary disorders are inflammation of the serous membranes, chronic vomiting, diarrhœa, tubercular liver, valvular obstruction of the heart, and, above all, coma. At the same time, the secondary symptoms themselves, under appropriate management, may be occasionally removed, and the patient afterwards enjoy tolerable health. Recently, a case of this kind has fallen under the author's attention; and Dr. Bright has affirmed, as the result of his latest observations, that, with care, life may be prolonged many years; and, without care, may be materially shortened.

Pathological Characters.—They differ essentially, according to the stage in which the malady proves fatal. These have been divided by Dr. Christison into three: 1. The *incipient*, which is in some instances —if not in all—a state of congestion or reaction. 2. The *middle stage*, in which the cortical substance is nearly or wholly destroyed; and 3. The *advanced* or *final stage*, in which the tubular portion is likewise invaded, and more or less obliterated.

In the *first stage*, the characteristic alterations are not readily traced. When the disease proves fatal in the early period of the acute stage, the kidneys are often found flabby, friable, and unusually large,—at times, more than twice the natural size; much darker and more vascular externally, and with points and starlike spots of ecchymosis; internally, dark brownish-red, or almost reddish-black, gorged more or less with blood, which exudes copiously from a cut surface; and they frequently present throughout their whole structure, but more especially in their cortical portion, lines, small roundish specks, or stellated spots of still darker colour, like ecchymoses, and not easily removed by washing. These spots have been supposed by M. Rayer, to be the Malpighian glands, in a state of congestion. The cortical substance almost always seems greatly broader than in the healthy state. Occasionally, too, there is, in the cortical substance, the appearance of granular matter, of a dark reddish-yellow tint, deposited here and there. White spots, too, which derive their appearance from the collection of fatty matter, begin, according to Mr. Toynbee, to be perceptible. The lining membrane of the pelvis of the kidney is commonly very vascular and red. The bladder is always found much contracted, and commonly contains only a drachm or two of urine, which always possesses the characters already described. The appearances in other organs of course vary according to the precise nature of the secondary affection.

The *second stage* is characterized by the deposition of granular or cheese-like matter, confined, for the most part, at first, to the cortical substance of the kidney chiefly. As this deposit takes place, the natural structure of the kidney gradually disappears. Still, the tubular structure may remain unimplicated. The size of the kidney, in this state, varies; sometimes, it is natural; at others, larger than natural; very rarely diminished. The consistence and colour vary; and, when the investing membrane is removed, which may be generally done with facility, the outside of the kidney is seen to be more distinctly mottled brown or gray, or else uniformly grayish or yellowish, with numerous vascular spots often forming lines of stellated chequerings. The surface has, consequently, a granular appearance, and is often rough from a granular structure. When a section is made of the organ, the cortical substance, instead of presenting its natural appearance, is grayish, grayish-red, grayish-yellow or reddish-yellow, without any striated arrangement, and of a uniform granular texture, chequered, occasionally, with reddish or brownish spots. When the kidney is injected, the matter of the injection, according to Dr. Bright, does not enter into the granular structure. This structure is, at times, distinct; at others, it requires the aid of a lens to distinguish it, when the morbid tissue is torn; and, in other cases, a smooth, homogeneous structure, like that of the brain, is alone perceptible; whilst, in others, again, the structure is homogeneous and friable, and not unlike the fatty degeneration of the liver; fat, according to Mr. Toynbee, being deposited in the cells of the parenchyma.

The granulation of the cortical substance of the kidney may exist to a great extent without the tubular being affected.

In the *third*, or *most advanced stage* of the disease, the morbid deposition implicates, also, the tubular portion of the kidney; occasioning, in both, an absorption of the healthy structure, and a morbid formation in its place. Generally, in this stage, the kidneys are diminished in size, although they are, at times, of natural size, and, at others, larger than natural. The surface is usually rough and irregular, and has been compared to the roe of the salmon, or the mineral grisolite. The common external colour is pale grayish-yellow. The consistence varies greatly from the healthy to the almost cartilaginous. A section of the kidney exhibits the cortical substance entirely occupied by grayish-yellow granulations, or by a homogeneous substance, something like the fatty degeneration of the liver; the same matter is deposited between the tubular masses and often among the tubuli; the tubuli themselves are of a pale flesh-red colour, more finely striated than usual, compressed, broken up, and some even obliterated, their place occupied by the morbid deposit. At times, one kidney has been found wholly converted into the granular deposit,—the ureter being consequently useless; and it has been seen obliterated. The renal veins often present firm fibrinous clots, extending into their ramifications, and occasionally adherent.

Sometimes, on dissection, the kidneys alone are found to be diseased, but, more commonly, there is a complication of morbid appearances, differing according to the precise organs concerned.

By those, who look upon all morbid degenerations to be the result of chronic inflammation—a view, which appears untenable—the granular disease of the kidney has been thus regarded;—hence, the term *Nephritis albuminosa*, which has been given to it by M. Rayer, and adopted by M. Grisolle and others. The latter observer considers it to be a specific inflammation, the effect of which is to produce on the kidney a special transformation of tissue. It has been supposed to be owing to a hypertrophied condition of the granulations, which are presumed, by Malpighi and others, to exist naturally in the cortical substance, and hence to be analogous to the mammillated liver. M. Andral remarks, that he has seen the granulations, in one instance, in the tubular structure; but Dr. Gross thinks this is probably a mistake. "According to the theory we have advanced," he observes, "they should always be confined to the vascular substance, and this—as we are informed by Bright—is uniformly the case." The invasion of the tubular structure by the granulations cannot, however, be doubted. The fact has been recorded on excellent authority, that of Dr. Christison, and the author has lately had a case, in which it was incontestable.

Of late, the precise morbid condition of the kidney in this disease has been a source of interest to many observers. M. Becquerel considers fibrinous infiltration of the Malpighian bodies to constitute the fundamental phenomenon of the disease. As they enlarge, the dimensions of the cortical substance become increased; and, if greatly enlarged, separation, disaggregation, and even partial disappearance of the tubular cones result. Their pressure on the cellular tissue and blood-vessels likewise occasions atrophy of the former, and obliteration of the latter. The view, however, which, perhaps, has received the most favour, is that of Dr. George Johnson, of London, who regards the disease as primarily and essentially an exaggeration of the fat, which exists naturally, in small quantities, in the epithelium cells of the healthy gland,—a fatty degeneration of the kidney, analogous to the fatty degeneration of the liver as shown by Mr. Bowman. This accumulation of fat in the secretory cells necessarily leads to the engorgement and dilatation of the tubules which they line, and one or more convoluted tubes, thus gorged with fat, and projecting either on the surface of the gland, or on the surface of a section, constitutes one of the so-called, "granulations of Bright." In some of the Malpighian bodies, Dr. Johnson observed no fat, whilst others contained gorged fatty cells, but he never noticed in these bodies an accumulation sufficient to produce destructive pressure on the Malpighian tuft of capillaries. The frequent connexion of albuminous and bloody urine with the disease, and the atrophy of the kidney, are attributed by him to the mechanical operation of the fatty accumulation described above, which he frequently found to coincide with a similar fatty degeneration of the liver, arteries, and valves of the heart; and he considers them all to be of constitutional origin, and neither to be regarded nor treated as local maladies.

The view of Dr. Johnson has been embraced by Drs. Bright, Budd, and Todd; the last of whom proposes that instead of the name "granu-

lar kidney," we should use that of "fatty kidney," as we speak of fatty liver. On the other hand, Dr. C. J. B. Williams denies, that the deposit is of a fatty nature, and the facts which he adduces in support of his opinion are derived from its optical and chemical properties. Although fat globules, in considerable numbers, may be occasionally seen in it, he regards this as an exception rather than the rule. The granular matter is, in some instances, far less refractive than oil-globules,—such, for example, as are commonly seen in the cells of the liver, as may be made obvious by comparing them in the same field. The chemical reaction of the matter likewise differs from that of fat,—for it resists the action of caustic potassa, and of ether,—separate or combined; whereas acetic acid partially dissolves them. Dr. Quain, too, affirms, that in fifty cases, examined with the view of testing the correctness of Dr. Johnson's theory, only one exhibited the fatty deposition in any remarkable degree. In many other instances he observed the presence of fatty globules, but not to such an extent as to induce the belief, that the presence of fat could be the only organic change that had taken place. In almost every case, he found decided evidence of the presence of other cacoplastic deposits, such as are found in other organs and tissues which have been the seat of unhealthy inflammation or degraded nutrition; and he infers, from all his investigations on this subject, taken in connexion with those of Dr. C. J. B. Williams, that the disease under consideration consists in the deposit of a badly organizable or cacoplastic matter in the cortical substance, and within the lobes of the kidney,—the deposit generally taking place in an unhealthy system, as the result of congestion produced either mechanically "as by diseased heart, or by some irregularity in the function of the skin." Dr. Quain is, hence, of opinion, that Dr. Johnson had taken a limited view of the morbid condition of the kidney in this disease. It would appear, too, that MM. Gluge and Canstatt, many years previously, had stated that a fatty deposition in the substance of the kidney was the characteristic feature of one form of the Morbus Brightii.

Dr. Eichholtz, again, considers the disease to resemble the granular liver (see Cirrhosis of the Liver), in being dependent upon an abnormous condition of the blood, and characterized by the excessive development of a substance resembling fibro-cellular tissue, by which the peculiar glandular structure of the affected organs becomes compressed, and their functions interfered with; a view which has analogy in in its favour; and lastly, Mr. Toynbee agrees with Dr. Johnson in his view as to the deposition of fatty matter in the kidney. He believes, however, with Drs. Bright, George, Robinson, and others, that a congestive condition of the blood-vessels of the organ precedes, and necessarily so, the deposition of fat, the enlargement of the viscus, or of its uriniferous tubes, or of any other of its vessels: in which belief Dr. Johnson does not accord.

On the whole, it must be concluded, that like other morbid degenerations, the granular is owing to a *vice* of the system of nutrition, the precise nature of which is, in the existing state of knowledge, inexplicable.

Treatment.—When the symptoms are manifestly acute, it may be necessary to take away blood from the general system, and to repeat it, should this appear to be necessary. In many cases, however, especially when the practitioner is not consulted until the signs of debility have become marked, the patient will be found not to bear well the copious abstraction of blood. In such cases, cupping over the region of the loins affords the advantages of both depletion and revulsion. The good effect of this, as of other remedies, is exemplified by the relief of uneasy symptoms, by the urine losing more or less of its coagulability, and maintaining or increasing its density.

When the force of the circulation has been reduced by general or local bleeding, or both, as well as by the adoption of the whole antiphlogistic treatment, revellents—as frictions with the tartarized antimony ointment or croton oil, or even the irritation produced by a seton—afford essential benefit. The objection to blisters with cantharides applies here with equal force as in nephritis; especially, as, according to some, albuminuria may be actually induced by cantharides or their active principle, received into the system.

Under the idea, that the disease commonly recognises, for its cause, cold and moisture, and is, therefore, dependent upon suppressed perspiration, diaphoretics have been highly extolled by Dr. Osborne. The vapour bath has been recommended, as well as diaphoretics generally. The *pulvis ipecacuanhæ et opii*, (gr. v.—viij. ter die,) has been advised along with the warm bath every 24 or 48 hours. Saline diaphoretics are properly regarded to be unadvisable, as they are more apt to pass off by the kidneys than by the skin. It is extremely questionable, however, whether obstructed diaphoresis be amongst the causes of albuminuria, and whether it ought not rather to be looked upon as an effect. When, therefore, the entire surface is restored to a perspiring state, and recovery follows, it is more probable, that as the morbid cause of the suppression of perspiration has yielded, the consequence—the suppression itself—yields likewise. This, however, can be esteemed only as a general rule; for it will be often found, that general perspiration, both spontaneous and apparently produced by reputed diaphoretics, fails to produce any material relief. Diaphoretics cannot, certainly, be regarded as efficient agents; still, whilst they are taken, the patient is always subjected to quietude and other management that may exert a decidedly beneficial influence.

Catharties do not afford any essential aid in the management of this disease, and can only be employed to relieve existing constipation. Aloes,[a] or colocynth,[b] may be used for this purpose.

[a] R.—Aloes,
Sapon. āā partes æquales.—
Fiant pilulæ gran. quinque singulis.
Dose, two pills, at bedtime.

[a] R.—Ext. colocynth. comp. part. ij.
— hyoseym. p. j.—M. et fiant pilulæ gran. quinque singulis.
Dose, two, at bedtime.

Where, however, signs of severe encephalic mischief supervene, other active cathartics may be needed, which might not be esteemed proper in mere granular disease, owing to their affecting the kidneys also as diuretics.

Of diuretics the same sentiments have not been entertained by all therapeutists. They have generally been regarded as unadvisable, especially in the early periods of the disease; but they are recommended by some observers. M. Rayer advises them, and especially the decoction of *cochlearia armoracia*. He farther states, that he has derived great benefit from the internal use of cantharides,—ten or twelve minims for a dose, in an almond emulsion. Purgatives, associated with diuretics, are recommended by Dr. Prout; and Dr. C. J. B. Williams affirms, that the diuretics which answer best are the tincture of cantharides, the tincture of digitalis, and cream of tartar in small doses, "combined with opium or tincture of henbane, to soothe any irritating effect these remedies may have." "It has been supposed," he adds, "by some that diuretics are pernicious. I believe that they may do great harm in the early stage of congestion, as they are liable to convert it into inflammation, but after this is removed they come into useful operation."

Notwithstanding the ingenious argument of Dr. Christison,—that an agent, which increases the secretion of an organ may not add to existing disease in that organ, diuretics—irritating diuretics—must be considered as equivocal remedies, and, on the whole, he is desirous of so regarding them in relation to the disease under consideration; but is of opinion, that the "dread of an evil influence from them over the primary disease has led several estimable authorities to forbid their employment likewise in all secondary affections, in some of which no other remedies are so promptly efficacious."

As a revellent, mercury has been advised by MM. Martin-Solon, Romberg, and others; and if there were no special objection to it, the remedy would seem to be as well adapted for the removal of this glandular lesion as of many others for which it is prescribed. It must be borne in mind, however, that mercury is considered, by some, to induce albuminuria: moreover, it is affirmed, that its peculiar effect on the mouth is developed with extreme facility in this disease, and that, when once induced, it is apt to be uncontrollable and violent; whilst it has not proved of any service to the primary affection. If employed at all, it should be under a wise caution.

When the disease has passed the acute stage, or when it appears to be *chronic* from the first, but little can be done. Revellents may, however, be employed from time to time; and everything should be avoided that could irritate the kidneys. Food, easily digestible, nutritious, and not in too great quantity, with total abstinence from all spirituous liquors; warm clothing, with flannel next the skin; the occasional use of the warm or vapour bath; the avoidance of all irregular exposure to cold and moisture, with regular exercise whenever the weather will admit of it, are the agencies, which may prevent the extension of the organic mischief, and the supervention of the secondary affections. They who entertain the views of the pathology of the disease embraced by Dr. George Johnson adopt a tonic medication in all cases, with the avoidance of fatty articles of diet more especially. The indications which he lays down: are *first*. The pursuance of a general tonic regimen in respect to diet, atmosphere. exercise,

and medicine. *Secondly.* The careful avoidance of all exhausting remedies. *Thirdly.* Avoiding, as articles of diet, fat, and other highly carbonized materials; and *fourthly.* Relieving congestion of the gland by strict attention to the functions of the skin and bowels, and by such small bloodlettings as circumstances might demand.

Should secondary affections supervene, they must be treated by means that are appropriate, bearing in mind the existence of the primary mischief, but not allowing it to interfere with the employment of important therapeutical agencies, should the advantage, to be derived from them in the secondary and more serious disease, preponderate over the supposed injury they might inflict on the primary. In some cases of pleurisy supervening on granular disease of the kidney, the symptoms have been so masked as not to be readily detected by the ordinary symptoms. This fact must be borne in recollection, and frequent attention be paid to the physical signs.

VIII. NEURALGIA OF THE KIDNEY.

Synon. Neuralgia Renum, Nephralgia; *Fr.* Névralgie des Reins, Néphralgie, Dysnéphronervie (*Piorry*); *Ger.* Nierenschmerz.

Severe pain in the kidney is a concomitant of many diseases of the organ,—as nephritis, granular disease, and especially renal calculi. The nerves of the kidney are doubtless also liable to attacks of true neuralgia, which, according to M. Piorry, can only be suspected, when excruciating pains in the region of the kidney alternate with neuralgia in other parts of the economy. Should it exist, it is amenable to the same treatment as directed under Neuralgia of the Liver.

IX. CALCULOUS FORMATIONS IN THE KIDNEY.

Synon. Calculus Renum, Nephrolithiasis, Lithia renalis, Lithiasis nephritica, L. Renalis, Renal calculi, Gravel, Sand; *Fr.* Calculs renaux, Gravelle; *Ger.* Nierenstein, Harngries, Harnsand.

The urine contains, in the healthy state, several constituents, which are occasionally deposited in the kidney, or in some part of the urinary organs, whence they may ultimately pass into the bladder, often giving rise to a train of powerful symptoms, known under the denomination of a *fit of the gravel;* at others, they excite acute or chronic nephritis; and at others, after having passed along the ureter, and occasioning intense irritation, they remain in the bladder, giving rise to stone in that organ. Or, again, calcareous concretions may form in other parts of the urinary apparatus, or not until the urine is discharged. All these will require a distinct consideration: in the first place, however, it will be proper to make inquiries into the nature of *urinary calculi*, and the *calculous diathesis* in general—*Urolithiasis, Lithia, Lithiasis;* Fr. *Calculs urinaires;* Ger. *Verirdung* oder *Steinkrankheit in den Harnwerkzeugen.*

In the healthy condition, the urine lets fall but little precipitate, until it undergoes decomposition. Such, however, is the case only in perfect health. Any irregularity of the functions of innervation, circulation, or digestion, disturbs this condition; the appearance of the urine becomes changed, and a pulverulent substance falls to the bottom

of the vessel; or reddish-brown crystals are observed scattered about its sides and bottom; but the derangement is temporary, and it passes off as the effects of the accompanying or preceding disorder disappear. Such is not the case with the depositions that are the result of a calculous diathesis, which often appears to be dependent upon an organization, derived from progenitors, but is frequently also acquired.

That the calculous diathesis is connected with a morbid state of the secerning function of the kidney is clear. The organ forms that which it ought not; and the urine deposits matters contained in it, very different from what it does in health. This *vice* of secretion is, however, connected with a morbid condition of other organs; the whole system of nutrition, appears, indeed, to be morbidly implicated; the gastric functions are imperfectly performed; the nutrition of the body is impaired; and, in the phosphatic diathesis especially, when greatly developed, every symptom is present, which is considered to denote dyscrasy or cachexia.

The ordinary urinary calculi arise from the deposition of matters contained, in greater or less quantity, in the urine in a state of health, but rendered insoluble owing to circumstances to be inquired into presently; some, however—as the mulberry, which is composed of the oxalate of lime—do not exist in the urine in health, and must, consequently, be separated, or formed from the blood by the kidneys. It is probable, however, that the fault is not altogether renal in these cases; and that the blood is modified in consequence of general faulty nutrition,—so that it contains matters, which are not present in it in the healthy state. This is confirmed by the fact of the great similarity between the calculous and the gouty diathesis. It is a common and correct observation, that of the children of gouty parents, some may be liable to gout, and others to calculus. Both diseases, too, are accompanied by more or less gastric and intestinal derangement, and by modified nutrition in general, and another striking point of similarity between them is—the presence of the lithate or urate of soda in the concretions that are met with in the joints of those, who have suffered repeated arthritic attacks. Now, the lithic or uric acid was at one time presumed to exist in the urine only; yet, in these gouty cases, it is separated from the blood by other organs than the kidneys; and it is probable, that in calculous cases, the blood may contain the elements of the calculous deposits in unusual quantity, and not in the same state of admixture as in health. These inferences are essential in a practical point of view, inasmuch as they indicate the importance of attending not only to the condition of the kidneys; but that the state of the whole system should be regarded; and observation exhibits the value of such attention.

The chief sediments, that form in the urine, may be conveniently treated under two heads, according to the two sets of salts that form the main precipitates, each of which has indeed its own diathesis. *First*, the *lithic* or *uric*, in which the lithic acid and the lithates form the precipitate; and, *secondly*,—the *phosphatic*, in which the phosphatic salts are deposited.

a. *Deposits of Lithic acid and the Lithates.*—Lithuria, Lithourorrhée, of *Piorry.*

These calculi are by far the most common. Their nature and causes are, consequently, most interesting. They are presumed, by Dr. Thomas Thomson, to be—in two cases in three—the first step in the formation of urinary calculi, wherever formed—in the bladder or in the kidney. Lithic acid has, indeed, been estimated by Dr. Prout, to predominate in more than one-third of the whole number of urinary calculi; and in 342 specimens, examined by Dr. Golding Bird, the proportion was even larger.

Nuclei consisting of uric acid or urates, -	262
cystic oxide, - - -	11
oxalate of lime, - -	45
phosphates, - - -	21
	339
mixed calculi, - -	3
	342

It is proper to remark, however, that but an imperfect estimate can be formed of the relative occurrence of different forms of calculi by collections of specimens. This is sufficiently shown by the following table from M. Simon.

According to	Oxalates.	Urates.	Phosphates.	Total.
1. Brande, in Hunterian Museum, .	1 : 13·5	1 : 2·46	1 : 2	150
2. Marcet, in Guy's Hospital, . .	1 : 3	1 : 4	1 : 3	87
3. Wood, in Canterbury Hospital, .	1 : 3	1 : 1·18	1 : 7	167
4. Yelloly, in Norwich Hospital, .	1 : 2·9	1 : 3	1 : 76	329
5. Marcet, " " . .	1 : 3	1 : 2·7	1 : 32	181
6. Henry, Manchester Hospital, . .	1 : 10·33	1 : 2·2	1 : 85	187
7. Smith, Bristol Hospital, . . .	1 : 3·3	1 : 3·33	1 : 10·89	218
8. Rapp, in Swabia, ...	1 : 1·43	——	1 : 10·1	81
9. Scharling, Copenhagen Museum, .	1 : 6·6	1 : 1·6	1 : 6·2	155

Although the nucleus most commonly occupies the centre of the calculus, this is not always the case; and in a few calculi, several distinct nuclei are met with. In some cases, calculi appear to possess no nuclei,—the centre being occupied by a cavity full of stalactitic or mammillated projections. This has only been observed in lithic acid calculi.

Urine, containing lithic acid in abundance, may scarcely differ, when first voided, from the healthy,—from that, at least, which is often passed by those who have no calculous diathesis whatever. Persons, apparently in perfect health, may void urine, which completely encrusts the utensil, and, of course, contains an unusual quantity of lithic acid. The urine is, in those cases, of a higher colour than natural, and is perfectly transparent. The crystals of lithic acid are deposited as the urine cools, adhere to the sides of the vessel, and remain loosely in multitudes at the bottom. It would not appear, that urine, which is depositing lithic acid, is of greater specific gravity than natural. Experiments by Dr. Robert Willis have shown it to be of the density of 1·018, 1·020, and 1·022.

Calculi or crystals of lithic acid are usually of a brown, reddish, purple, or fawn-colour; at times, as dark as mahogany or walnut; but occasionally of a bright yellow colour, or white, (*Simon.*) The crystals seem to be four-sided prisms, resembling sea-sand or Muscovado sugar in appearance, but drier and more gritty. When not distinctly crystallized, the surface is often smooth and irregular; but more frequently, perhaps, tuberculated. Internally, the arrangement appears to be in concentric layers, and they present, when broken, the appearance of imperfect crystallization, or of no crystallization whatever. In the latter case, they have been found to contain lithate of ammonia. When exposed to the heat of the blowpipe, they give off a peculiar animal odour, become black, and gradually consume, leaving a small quantity of white alkaline ashes. They are wholly soluble in caustic potassa, and are precipitated by acids, under the form of a white granular powder. A fragment, put into a watch-glass with a little nitric acid, and heated, dissolves with effervescence, and the solution, evaporated to dryness, leaves a residuum of a beautiful purple colour. Crystals of lithic acid are very sparingly soluble in water, requiring 10,000 times their weight to dissolve them; and this circumstance has given rise to much difference of sentiment amongst chemists as to the means by which the acid is held dissolved in the urine, in the quantity in which it is often met with. The explanation of Dr. Prout has appeared to be the most simple, although chemical objections may be urged against it. He is of opinion, that the lithic acid of the urine is, in health, in the form of a soluble lithate of ammonia—a superlithate; and that its deposition from the urine is owing to the presence of a free acid in that fluid, which lays hold of the base;—but the point is unsettled, and demands farther investigations. Liebig considers that the uric or lithic acid, (with the hippuric,) is held in solution by the phosphate of soda, which, from being bibasic or alkaline, is rendered acid by yielding up a part of its soda to these organic acids, which are thereby rendered soluble.

All the varieties of lithic acid calculi, according to Dr. Griffith, are explicable by assuming them to be derived from the right rhombic prism. When examined by polarized light, the crystals of lithic acid develope splendid colours.

Lithate of ammonia is almost always amorphous. The radiating needles seen upon its surface have been described as composed of superlithate of ammonia; but Dr. Griffith states, that he has not obtained enough to enable him to speak positively on this point.

The following table gives the deposits that occur in lithic states of the urine, according to their colour and state of aggregation:

Red crystalline sediment, composed of	Lithic acid and the colouring matter of the urine. The crystals are rhomboidal prisms, which in the field of the microscope appear under the form of pretty regular lozenges, generally of a beautiful topaz-yellow colour singly. (*Vigla* and *Quevenne.*) Occasionally, the tubular, and more rarely the rhomboidal, varieties are found united in the form of a cross, or of stars of various degrees of regularity. They are frequent in the bright orange-red sand, and are often abundant in the pink deposits of lithate of ammonia. (*G. Bird.*)

Lateritious, red, or reddish-brown sediment, composed of	Lithate of ammonia; purpurate of ammonia and soda; colouring matter of the urine; and occasionally an admixture of the earthy phosphates. (*Prout.*) Lithic acid, combined with the colouring matter of the urine. (*Vigla.*)
Yellowish sediment, composed	Essentially of lithate of ammonia; a little lithate of soda, colouring matter of the urine; more or less of the earthy phosphates. (*Prout.*) Of lithic acid, combined with less of the colouring matter of the urine, than in the preceding form of deposit. (*Vigla.*)
Pink sediment, composed of	Lithate of ammonia; purpurate of ammonia. (*Prout.*) Lithic acid almost wholly; some lithate of soda; animal matter, and a little phosphate of lime. (*Quevenne* and *Vigla.*)

It has been before remarked, that lithic deposits take place in certain conditions of the functions of innervation and circulation; and likewise, under certain derangements of the digestive operations. They also occur, almost invariably, to a greater or less extent at the termination of febrile paroxysms; and hence the favourable prognosis deduced from the lateritious sediments in such cases; but, independently of febrile disorder, there is a morbid disposition to deposit lithic acid and the lithates. This is what is called the *lithic diathesis.*

Causes.—Age has unquestionably an influence in causing the deposition of lithic acid. In infancy, we observe it, and between 40 and 60; whilst at other ages it is by no means as frequent. The different forms, in which the lithic acid depositions occur, are said, by Dr. Prout, to be remarkably under the influence of age. In the earlier periods of life, the tendency is to the deposition of amorphous sediment and crystallized gravel; in middle age, the amorphous concrete mass more commonly occurs, giving occasion to the formation of renal and vesical calculi; and in more advanced life, there is, occasionally, a disposition to the development of numerous small lithic calculi—pisiform concretions—around minute nuclei. Although exceptions to these general laws occur, they are stated, by the eminent observer last cited, to be of sufficient constancy to allow of the age and constitutional symptoms of a patient being judged of from a simple knowledge of the characters of the lithic deposits passed by him.

It is obvious, that whatever, at any age, occasions an increase or excess in the saline constituents of the urine, may favour the deposition. Lithic acid—as has been remarked—is extremely difficult of solution, and the lithate of ammonia—the most soluble of its salts—requires about 480 parts of water to effect its solution. Should, therefore, the quantity of lithic acid or the lithates be increased from any cause, a deposition must take place. The affinity, too, of lithic acid for the bases with which it is associated, and by which its solubility is somewhat increased, is so slight, that even the weakest of the acids—the carbonic, citric, acetic, &c., are powerful enough to dispossess it, and to effect its precipitation in a concrete form.

It is the common opinion of pathologists, that one of the most potent causes of the lithic diathesis is indulgence in large quantities of animal and other varieties of nutritious food. This may be harmless, provided much exercise be taken; but if, along with such indulgence, the patient live a sedentary life, the chances are more numerous, that

he will be affected with the lithic deposits. The muscular system—it has been well observed, by MM. Magendie and Andral—is the most rapid in its nutrition, and consumes the greater part of nutritive substances, when it is often exerted. They, consequently, who exercise their muscles much, require to eat more, and to make greater use of animal or azoted aliments. But if the same quality and quantity of food be taken, when the muscular organs are kept at rest, the latter do not appropriate all the nutritive azoted matter; hence it is in excess in the economy; is directed towards the kidneys, which are properly esteemed to be the chief emunctories for the azote; becomes transformed into lithic acid, and thus concurs in the formation of gravel or calculus.

The remark, already made, that lithic acid is readily separated from its bases by any feeble acids, exhibits the mode in which the presence of free acid in the system may give occasion to its deposition, and accounts for the occurrence of the lithic diathesis in early life, when there is a great predominance of acidity, and the child mainly subsists on milk—a highly azoted fluid. Animal food not only lays the foundation for the tendency to form a larger quantity of lithic acid, but to a diminished secretion from the kidneys, and the smaller the quantity of the solvent, the less the saline matter that can be held in solution.

Amongst the special causes of the deposition of lithic acid and the lithates must be reckoned—various drinks that are habitually used. Water, beer, cider, and thin wines, augment the quantity of the urine, and may thus far be serviceable; but the more generous wines and spirituous liquors, as well as tea and coffee, have been considered to diminish the urinary secretion. In this, however, there is doubtless much that is imaginative. Certain spirituous liquors—as gin—have obtained a reputation as diuretics; and, certainly, when they are taken much diluted, they augment the secretion from the kidneys; but it would be difficult to prove that they, as well as tea and coffee, diminish the secretion, whilst beer and cider augment it, and that the former are therefore bad drinks for those of calculous diathesis, whilst the latter are to be recommended. Almost every one, who has suffered under lithuria, must have been impressed, that the very drinks to which the preference is here given, are those that seem, with him, to favour the deposition. "If," says M. Magendie, "a great eater of animal substances drinks much water, light and sparkling wines, &c., the quantity of his urine will be more than sufficient to dissolve the uric acid formed by the kidneys, and he will be less exposed to an attack of gravel; but if, on the contrary, he drinks little, and does not drink in proportion to the aliment he consumes; or, still more, if he drinks much, but of liquors charged with alcohol,—such as the strong wines of the country, brandy, strong liquors, &c.—his urine will be less abundant, and it will, consequently, dissolve less uric acid; this acid will, therefore, have a greater tendency to separate and to form gravel." It is proper, however, to remark, that, amongst English writers on the subject of calculous disorders, difference of sentiment has existed as to the effect induced by beer and cider in their causation; and this difficulty is greatly owing to the singular fact, that the

tendency to urinary deposits is much influenced by locality; and that whilst the cases may be rare in one region,—in another, not far from it, they may be extremely common. Thus, according to Von Wattmann, in Vienna and Lower Austria, the proportion of calculous cases is 1 in 24,620; whilst on the Ems and at Salzburg, it is 1 in 46,390; in Galitzia, 1 in 227,000; in Moravia, 1 in 52,480; in Bohemia, 1 in 33.790; in the Tyrol, 1 in 70,954; in Styria, 1 in 85,472; in Illyria and the maritime states, 1 in 37,254; in Venice and the eight provinces, 1 in 7,310; in Milan and Lombardy, 1 in 3,022; and in Dalmatia, 1 in 783;—the proportion in the whole population of Austria being about 1 in 15,531.

Everywhere, the same difference as to the ratio of calculous cases is observable. Whilst in the county of Norfolk, England, one case of calculus occurs in every 21,000 of the inhabitants, and ten or twelve operations for stone have been performed annually, and for many successive years, in the Norwich Infirmary—the disease, according to Dr. R. Willis, seems to be entirely unknown in the county of Hereford, no patient having been received into the Hereford Infirmary in a period of upwards of forty years, and no record being extant of the operation of lithotomy having ever been performed within the bounds of that county; yet Herefordshire and Devonshire, it must be recollected, are cider-making and cider-drinking counties. Dr. Willis remarks, that particular articles of food or drink have immense influence in producing the state of urine that leads to the deposition of crystalline matters, which consist—in the great majority of instances—of lithic acid, or an acid very intimately allied with it, namely, the oxalic united with lime as a base; and this, he thinks, is happily elucidated by a fact, which was communicated to him by Dr. Joshua B. Flint, of Louisville. Fifty years ago, according to Dr. Flint, the city of Boston was noted for the frequent occurrence of stone; and there was then no surgeon of any name, who had not been repeatedly called upon to perform the operation for its removal. Calculus is now, however, a very rare disease in Boston. Dr. Flint is said to ascribe this remarkable change to the discontinuance of punch as a beverage. Fifty years ago, punch—he affirms—was the standard drink of all classes, and on all occasions; but, at present, no one drinks it: but admitting that punch may be, "of all the compounds taken into the stomach, perhaps the most powerful in producing a state of urine which is followed by the precipitation of the lithic acid and the lithates," and that a change approximating, if not equalling, that described by Dr. Willis, has occurred in Boston, it is very questionable, whether the change be owing wholly to the cause assigned, and whether agency be not ascribed to diet, which ought to be transferred —in part, at least—to other influences,—such as a better system of clothing and warming; greater protection against atmospheric changes; and mutation of local influences under the increase of population. The difficulty is not diminished by the additional observation of Dr. Willis, that no country in Europe suffered so much from gravelly and calculous complaints, a century ago, as Holland. One lithotomist is reported to have performed the operation for stone at least two thousand

times! but, at present, calculus is not a very common complaint in Holland. The change, adds Dr. Willis, is probably owing to the substitution of tea as a universal beverage, for the spirits or spirits and water, which, in former days, was consumed in large quantities, and by all classes of the community. Yet tea is classed by M. Magendie, with generous wines, spirituous liquors, and punch, amongst the agents that diminish the quantity of urine, and are favourable to the development of red gravel!

It has been a common assertion, that calculous diseases do not exist in tropical climates; but this appears to be far from the truth. Dr. J. Jackson, of Calcutta, in a letter to Dr. John Greene Crosse, of Norwich, states, that in the midland provinces, and in Upper India, there are few districts where these diseases are not prevalent amongst the lower classes, who are badly fed, and live on an unleavened bread; similar to the Norfolk dumpling. Few cases, however, are met with amongst the aged.

Again, eminent medical observers in the British navy have been struck with the extreme rarity of calculous diseases amongst seafaring people. Sir William Burnett having caused the returns of the British naval hospitals, at home and abroad, from April, 1830, to Nov. 26, 1836, to be carefully examined with reference to this question of medical statistics, it was found, that the only instance of the kind, recorded, was one of renal calculus in the hospital at Malta. The average number of seamen and marines, voted annually by the British Parliament, during the period mentioned, including 2,000 boys, was 30,000.

It is worthy of remark, as proving still farther the diversity of sentiment in regard to the etiology of calculus, that Mr. Hutchinson, from a very careful examination of all the results of his observations on this matter, advises a very sparing use of vegetables.

The opinion has prevailed almost universally, that the habitual use of limestone water disposes to calculous depositions, yet, it is certain, that the inhabitants of many limestone districts are remarkably exempt from them. In the great valley of Chester County, in Pennsylvania, where limestone abounds in every part of it, a case of stone is of rare occurrence. According to Dr. Thomas Harris, of Philadelphia,—a respectable physician, who had been in extensive practice there for twenty years, had never seen a case of it.

The disease is so generally attended by some form or other of dyspepsia, that the views of practitioners as to its causation have been directed to the stomach more than to any other part of the system; but it is very questionable, whether indigestion be more than one of the general disorders of function that accompany calculous depositions. That the condition of the kidney must not be overlooked by the pathologist is shown by the circumstance, that injuries of the lumbar region or kidney frequently induce not only phosphatic but lithic depositions. The fact, that one kidney is more frequently affected, shows, that one organ must be more liable to the depositions within it than the other, although we should, perhaps, infer erroneously, were we to say, that it certainly secretes more of the lithic deposits than the

other. The circumstance, moreover, is explicable upon the view, that some accidental cause of detention has arisen in one kidney rather than in the other, which has given occasion to the phenomena of renal calculus in it.

Reference has already been made to hereditary predisposition, which undoubtedly exists in many cases; and is, at times, extremely difficult to obviate. Stress has also been laid on the diminished temperature of the urine, which has been found—as well as that of the whole body—to be less in children and the aged than in the adult,—the diminished temperature impairing the solvent powers of the urine, and therefore favouring depositions; but it is not probable, that this circumstance can have much agency. Copious sweating, and any large serous evacuation, have been presumed to act in the same manner, by diminishing the quantity of the menstruum; yet, a regular perspirable state of the surface is presumed by all to be of great moment in the way of prevention. Indeed, the prevalence of urinary depositions has been referred to extensive and sudden alterations of temperature; and in the case of the county of Norfolk, already mentioned—the prevalence of the cold and damp east wind has been invoked in the causation by Dr. J. G. Crosse; but there must be other circumstances than these, inasmuch as on this continent, there are many places more unfavourably situate than Norfolk, which are not subject to the malady. Want of due exercise—remaining long in bed, and the habit of keeping the urine for a long time in the bladder; bodily fatigue; and, with some, great mental exertion, according to M. Civiale, also communicate a tendency to deposition, where the calculous diathesis exists.

It is obvious, from all that has been said, that the etiology of these depositions is sufficiently obscure.

Treatment.—The prevention and removal of the lithic diathesis reposes mainly on the avoidance of the various exciting causes that have been enumerated. Under the *vice* in the system of nutrition, it is usually important to make use of revulsion, such as a change of diet, and change of air, society, and scenery; and—especially if the individual have been accustomed to a sedentary life—to advise regular exercise. Warm clothing, flannel next the skin, and friction of the surface are also of especial moment; and diluents should be freely allowed. These are the main points of prevention, which are requisite even when the diathesis has become completely established, and when the evidences are visible externally, as well as in the internal phenomena. Under these latter circumstances, three indications have been laid down by M. Magendie, which embrace the main rules of management. *First:* To diminish the quantity of lithic acid formed by the kidneys;—by the avoidance of agents which favour its formation. *Secondly*, To augment the secretion of urine or of the menstruum, by the use of aqueous and slightly diuretic drinks; and *Thirdly*, To saturate the lithic acid. This last indication is accomplished by the exhibition of the alkaline carbonates in a state of great dilution. M. Magendie recommends the carbonates with excess of base; but their continued use is apt to injure the lining membrane of the stomach. It is pre-

ferable to employ the full carbonates or bicarbonates of the pharmacopœias, which may be taken for weeks and months, without injury. The bicarbonate of soda possesses all the properties of the class, and may be given in doses of 20 or 30 grains, two or three times a day, either alone, or—what is preferable on the score of taste—dissolved in the ordinary mineral water of the shops. By some, it is directed to be given in a thin mucilaginous liquid; but no advantage is obtainable from the mucilage, inasmuch as it is digested in the stomach; and, moreover, its digestion is not always easy, so that it is but little adapted for a morbid condition, in which the digestive function is generally already impaired. It has been suggested, that the alkalies should be given between the meals, otherwise they might destroy the characters of the *pepsin* or digestive element.

It was affirmed by Mr. A. Ure, that hippuric acid is found in the urine after benzoic acid has been taken; and that the quantity of lithic acid is thereby diminished. Hence, benzoic acid was recommended by him in cases of the predominance of lithic acid; but the observations of chemists have not established this: on the contrary, they have satisfactorily shown, that although the benzoic acid appears to be converted into the hippuric, there is no diminution in the quantity of the lithic acid.

A more important suggestion has been made by Dr. Golding Bird, founded on the remarkable solvent action of phosphate of soda on uric acid, to which Liebig has directed attention of late. This is to administer the salt in solution sufficiently diluted—a scruple to half a drachm, for example, in any vehicle, as broth or gruel. The solution then tastes as if it contained common salt, and is objected to by few. Dr. Bird administered it in two very chronic cases of lithic acid gravel; in one of which it rapidly caused the disappearance of the deposit. This occurred in the person of a lady about 40 years of age, who had, at his desire, used for some weeks the artificial Vichy water of the German Spa at Brighton without relief.

Dr. T. Buckler, of Baltimore, under chemical views given elsewhere, (see the Art. Gout; and *New Remedies*, 5th edit., p. 64. Philad., 1846,) prefers the phosphate of ammonia, which, he says, causes the lithic acid, when present in the urine, to disappear rapidly. Its dose may be ten to twenty grains, dissolved in water, and given three times a day.

For the dyspepsia, which is almost a universal concomitant of the disease, a combination of alkalies and bitters, or of alkaline earths[a] with bitters,[b] may be prescribed.[c]

[a] R.—Potass. subcarb. ʒj.
Aquæ calcis Oj.—M.
Dose, a wineglassful, two or three times a day, with ān equal quantity of new milk.

[b] R.—Magnes. ʒj.
Infus. gentian. vel calumb. fʒvi.—M.
Dose, the same as the next.

[c] R.—Sodæ bicarbonat. ʒj.
Infus. calumb. vel gentian. fʒv.
Tinct. calumb. vel gentian. fʒiij.—M.
Dose, a tablespoonful three times a day—an hour before each meal.

Sir Benjamin Brodie states, that the following combination agrees

well with the stomach, and produces a very immediate effect on the urine, where alkaline remedies are demanded.

R.—Magnes. gr. vj.
Potass. bicarbonat. gr. xij.
——— tartrat. gr. xv.—M.
To be taken at night in a glass of water.

Where circumstances will admit, change of air by travelling is very important; and if practicable, the change should be to waters in which the alkalies predominate. The waters of Vichy are much celebrated on the continent of Europe; so much so, that they are often prepared artificially. In this country, the Saratoga waters are an excellent remedy; and not the less so from the slight impregnation of iron, which they contain. It need scarcely be repeated, that no artificial, and no real, water drunk away from the spring, and, therefore, without the accompanying advantages of travelling air and exercise, can be regarded as substitutes for the water taken at the source.

b. *Deposits of the Earthy and Alkaline Phosphates.*

Urine, containing these depositions, has been termed *Ceramuria*, (κεραμος, "earth," ουρον, "urine,") by Dr. R. Willis. Phosphatic depositions may occur either in the form of sand, or they may be amorphous or crystallized. From numerous observations, it would appear, that lithic acid forms the nucleus of even other varieties of calculi. It would seem, consequently, that the deposition of lithic acid is a primary step in the formation of urinary calculi, and that the phosphatic formation is the result of a gradual transition from the lithic acid to the phosphatic diathesis. In the progress of this transition, the lithic acid deposition is, in the first instance, changed into one of the lithate of ammonia, with a loss of the tinge derived from the colouring matters of the urine. After some time, this last gives place to a sediment, which is chiefly composed of carbonate and phosphate of lime; and this is ultimately succeeded by a deposition of the phosphates of lime and magnesia, in combination with ammonia. From all his inquiries in this matter, Dr. Prout conceives himself warranted in deducing the general *law*, "that in urinary calculi, a decided deposition of the phosphates is never followed by other depositions." Deposits of phosphate of lime are always amorphous. The calculi are usually of a pale brown colour, and of a hardness and polish like porcelain. They are formed of very regular layers, which are usually thick, and easily separable. Their shape is commonly oval, and their size sometimes considerable. They resist the action of the blowpipe, dissolve readily in chlorohydric acid without effervescence, and are precipitated from their solution by ammonia. The calculi of the triple phosphate of magnesia and ammonia—the ammoniaco-magnesian phosphate—are almost always white. Their surface is usually irregular, and covered with small shining crystals; and their texture very imperfectly stratified, or, it may be, without any lamellated arrangement. They are soft, break readily, and are easily reduced to powder. At times, however, they are hard and compact, and their fractured surfaces present a beautiful crystallization and semi-transparency. It is not common

to meet with calculi composed wholly of ammoniaco-magnesian phosphate; whilst it is common to find it associated with the phosphate of lime, forming the variety of calculus called the *fusible*. In this case, according to M. Guibourt, it is white; friable, similar to lime; melts with remarkable facility in the flame of the blowpipe, and dissolves readily in chlorohydric acid.

Two distinct forms of crystal, according to Dr. Golding Bird, are presented by the triple phosphate, according as the proportion of ammonia varies. The first or neutral triple phosphate is frequently met with in the iridescent pellicle, which collects upon urine containing this salt; and under the microscope is seen to consist of beautifully defined transparent crystals, all of them being either prisms, or some modification of that figure. They are often strongly shaded on one side, and illuminated at the edges and angles, unless they are immersed in water or in some other powerfully refracting medium, when they appear perfectly transparent: the second, or bibasic phosphate, always occurs in alkaline urine, and is considered to be in all probability a secondary product. Dr. Bird has never found it constituting the entire mass of a deposit, but it can be frequently detected in mixture with phosphate of lime. Its crystals consist of thin laminæ, resembling foliage, and sometimes traversed by a transparent cross. When formed artificially, by the addition of ammonia to urine, they are always of an elegant stellar shape. When mixed with phosphate of lime, they constitute the fusible compound. The nature of any deposit or fragment of calculus containing phosphates may therefore be at once determined, by dissolving it in chlorohydric acid, placing a drop under the microscope, and adding ammonia. This occasions the precipitation either of an amorphous granular mass, of a series of stellar crystals, or both together: in the first case, the matter consists of phosphate of lime; in the second of the triple phosphate; and in the third of the fusible compound.

In the healthy urine, the phosphates exist in the state of super-phosphate, when they are soluble; but if any alkali be present in the urine, the excess of acid becomes saturated;—the super-sulphate is converted into the insoluble neutral phosphate, and is deposited. The neutral phosphate of lime is almost insoluble,—not more than half a grain being contained in an ounce of healthy urine. When examined by polarized light, the neutral phosphate, according to Dr. Griffith, produces the most brilliant colours: the stellar bi-basic triple phosphate produces little or no effect with polarized light. Phosphate of magnesia requires at least fifty times its weight of water to dissolve it; whilst the phosphate of ammonia is soluble enough of itself, but in combination with the phosphate of magnesia, as it always exists in urine, it is extremely insoluble. A slight excess of phosphoric acid, and—it would appear—the presence of carbonic acid in some cases, render those salts soluble: as super-phosphates and carbo-phosphates they become very soluble, and are readily evacuated.

The general symptoms, which accompany the deposition of the phosphates, or the *phosphatic diathesis*, are often extremely distressing. Both the *physique* and the *moral* are deeply implicated. Derangement

of the digestive organs is a universal concomitant, succeeded by all the symptoms of impaired nutrition. In some cases, in which the bladder has lost a portion of its muscular power,—as in disease of the prostate; affections of the spine, and in the aged,—the urine appears to be retained in the bladder long enough to undergo partial decomposition; ammonia is generated; and, as a necessary consequence, the phosphates are deposited. There is generally, along with the constitutional disturbance, more or less pain in the back; the urine is always of a pale colour when voided; and is in larger quantity than in health. At times, it is feebly acid when first passed; but, very frequently, it is neutral, and after the disorder has continued for some time, or is increasing in severity, it never fails to become alkaline. In some cases, it drops incontinently on the clothes; and is, under such circumstances, offensively urinous to the olfactories. Its specific gravity varies greatly according to the period of the day at which it is examined. It has been found as low as 1·004 in the early part of the day; and as high as 1·033 about 11 o'clock at night,—the time when it would appear, by experiment, to possess the highest density.

Causes.—Injuries of a local character have been already referred to as causes of phosphatic depositions. Injuries of the back and spine especially have certainly, in many instances, been connected with—and have probably caused—them. It has been affirmed, indeed, that in all cases of spinal irritation, the kidneys secrete an abundance of sabulous matter, and, after concussion of the spinal marrow, a larger quantity of this deposition has been observed, floating in a turbid, offensive, and irritating urine. Dr. T. Harris refers to a case, recorded in Duncan's Medical Commentaries, of an enormously large calculus, taken from the bladder of a man, who had some years before received a severe injury of his spine. Where the bladder is paralyzed or retention of urine occurs from any cause, the urine may become alkaline from decomposition, and give occasion to the deposition of the phosphates. Independently, however, of these local causes, a general morbid condition of the functions of nutrition always precedes the deposition of the phosphates, so that it has very properly been regarded as the sequence, and complement, as it were, either of some serious general constitutional disorder, or of a state of structural disease, or of great irritation of one or other of the urinary organs, which may, indeed, be itself the cause of the general disturbance of function. "We therefore find it," says Dr. Willis, "occurring amongst the unhealthy, ill-fed, and worse clothed children of poor, ignorant and profligate parents; or otherwise, when the heyday of life is gone, and the system is feeling the effects of an accumulating load of years,—of over-exertion, whether of mind or body, and perchance of excesses committed in early life,—circumstances by each and all of which it is often apparently induced."

Treatment.—So far as regards the use of chemical remedies, it is obvious, that they must be of an opposite character to those necessary in the lithic acid depositions. The method of chemical treatment, which has been indicated as appropriate for the lithic acid diathesis, would obviously be injurious in this; accordingly, alkaline remedies

must be avoided, and acids—especially the mineral—may be administered with great advantage. They may not only pass into the blood, and be separated from the kidney, but invigorate the digestive apparatus, and prevent fresh deposition. This, after all, is the great object of treatment; and, accordingly, the essential causes must be investigated,—whether general or local,—and, if possible, be removed or combated. If the adoption of a tonic and revulsive system of medication be advisable in the lithic diathesis, how much more must it be demanded here, where the morbid results are so much greater. We must, therefore, inculcate the necessity of a thorough change of all the physical and moral influences surrounding the individual, so as to break in upon the morbid catenation as effectively as possible. With this view, travelling air and exercise must be strongly inculcated, with all their revulsive accompaniments; the condition of the bowels must be attended to, and everything be adopted that can give tone to the general system. Attempts have been made to point out the diet that is best suited for the patient; but, on this subject, not much that is definite can be said. The good effects of change of diet appear, indeed, to be more owing to the change, than to the particular articles administered. It is asserted by Dr. R. Willis, that there is no kind of food, which gives such a feeling of renewed strength to a patient, who has suffered from an irritable state of system, and the secretion of urine superabounding in phosphates, as a slice of roast or broiled mutton. This is, doubtless, the fact; but it does not apply solely to cases of phosphatic deposition. The author, in order to effect revulsion—as far as diet is capable of so doing—has, in many cases, placed the patient on the use of saccharine matter, (*syrup. simpl.* f ℥iss.—f ℥ij. ter die,) given half-way between the meals, so that the digestion of the preceding meal may be effected before it is taken. An intelligent medical gentleman, from the interior of the state of Maryland, consulted him some years ago, labouring under a wretched state of health with copious deposition of the phosphates, which he could invariably correct by saccharine matter taken in this manner.

Fermented liquors may, in this diathesis, be taken in moderate quantity, and for the most part the more acid wines, as Hock, Moselle or Chably will be preferable to the others. The mineral water of the shops is here also proper for drink, whilst even its gentle acidity might be injurious in the lithic acid diathesis. As the alkaline predominance is here to be apprehended, alkaline effervescing waters must be avoided; but water, charged with carbonic acid,—as in the common mineral waters of the shops,—may be employed with advantage. Lactic acid has been suggested by M. Magendie, owing to the facility with which it dissolves the phosphate of lime.

R.—Acid. lact. liquid. f ℥j.—℥iv.
Aquæ Oij.
Syrup. f ℥ij.—M.
To be taken as a lemonade.

It need scarcely be said, that in order to carry out the principles mentioned above, all the vegetable and mineral tonics may be employed, and especially the chalybeates. Diosma, uva ursi, and chima-

phila, have been particularly recommended by some; but, apart from their tonic virtues, the author has had no reason whatever to believe that they possess any special properties in those cases.

From the well-known effects of strychnia on the functions of the spinal marrow, and under the belief, that where alkaline urine is really secreted as such by the kidneys, independently, of course, of the character of the ingesta, there is always some lesion of the marrow, Dr. Golding Bird recommended strychnia, which appeared to him to be followed by good results.

R.—Strychniæ gr. j.
Acid. nitric. dilut. f℥j.
Aquæ f℥xij.—M.
Dose, a fluidounce, three times a day.

To allay the irritation—general and local—which is so constant an attendant on this diseased condition, opium may be freely given, either in substance or in any of its preparations. "Under no circumstances," says Dr. Robt. Willis, "are we more bound to give the beneficent Author of the universe thanks for the virtue he has infused into the poppy, than when we are dealing with the cases that now engage our attention."

The lithic and the phosphatic are the two main diatheses. Occasionally, however, other calculi are deposited; and, frequently, those already described alternate with each other, so as to form what have been called the *alternating calculi*, which require the treatment to be varied according to the character of the deposition at the time prevailing.

c. *Calculous depositions of the Oxalate of Lime, or the Mulberry Calculus;* Oxaluria.

Oxalic acid is not one of the constituent principles of healthy urine: so that it is not easy to discover the modification of the blood, or of the urinary secretion, which gives occasion to its formation. The idea has been entertained, that the formation of oxalate of lime within the body depends either upon the nonassimilation of oxalic acid taken with the food, or upon the malassimilation of saccharine aliment. Hence, it has been advised, that sugar should be avoided by those labouring under this diathesis, as well as all kinds of fermented liquors, and plants—as the young stalks of the rhubarb plants and sorrel—which contain oxalic acid. Liebig and Wöhler, however,—and Dr. Golding Bird appears to accord with them—ascribe oxalic acid, not to any transmutation in the elements of sugar, but to the oxidation of uric acid, which is a highly azoted substance, and likely, therefore, to be augmented by animal diet.

The urine, according to Dr. Prout, is generally transparent, and remarkably free from sediments; of a pale citron-yellow, or greenish hue, and of moderate specific gravity.

Calculi of the oxalate of lime are commonly of a deep brown or black colour, similar to that of dried blood. Their surface is rugous, and tuberculated like the fruit of the mulberry, which has given them the name of *mulberry calculi*. They are hard and compact, and their texture presents an irregular stratified arrangement; their form is

spherical, and size not great. Under the blowpipe, according to M. Guibourt, they become covered with a white efflorescence, which reddens turmeric paper. When reduced to powder, they dissolve slowly in the chlorohydric and the nitric acids, and are precipitated from their solution by ammonia.

Oxalate of lime, according to Dr. Golding Bird, never occurs in an amorphous form. It is always regularly crystallized. The crystals are white, sharply defined, and always entire: they are perfectly octohedral, but differ materially in the acuteness of the terminal angles. When these are very acute, the crystals are seen lying on their sides, with their angles and edges exceedingly distinct. When the octohedron is more obtuse, the outline of the crystal appears perfectly square, having another square outline in its centre, so arranged, that the angles of the inner square are opposite the sides of the outer one. Sometimes they appear in the form of dumb-bells. By polarized light, these dumb-bells give the most splendid colours, whilst the octohedrons produce very little, and sometimes no alteration. When these crystals are allowed to dry, and then examined either in a drop of water, or Canada balsam, the inner square remains transparent, whilst the outer becomes opaque, and often absolutely black.

In cases of deposition of oxalate of lime, nothing but general management can be employed with any great prospect of benefit. No chemical antilithic is available in such cases; and the hopes of the practitioner must be reposed upon modifying the whole system of nutrition in the manner recommended under the other forms. It would appear, that acid aliments favour the precipitation of the oxalates. Two cases, according to Messrs. Magendie and Ratier, are on record, in which this occurred in persons who were accustomed to eat large quantities of sorrel. Accordingly, the treatment recommended for the lithic diathesis—the free use of diluents and of the carbonated alkalies—would seem to be appropriate.

It has been suggested, by Dr. Prout, that, where the oxalates are deposited from the urine, endeavours should be made to effect a revolution in the nature of the prevailing diathesis, and to change the oxalic diathesis into the lithic.

Under the use of muriatic acid, lithic acid is deposited abundantly in many cases; but—it has been properly asked by Dr. Robert Willis—are we quite sure, that there is not also oxalic acid elaborated at the same time, and, in consequence of the treatment, by possibility even in greater quantity than before? and if a nucleus be present upon which deposition may take place, the advantages of having lithic acid substituted for oxalate of lime are not great enough to compensate for the more rapid growth of calculi when they consist of lithic acid or the lithates. Dr. Willis thinks, that where there has been no deposition, Dr. Prout's idea might be acted upon, especially as there appears to be some testimony in its favour. In all cases, however, the main endeavour of the practitioner must be to modify the whole system of nutrition by the tonic and revulsive methods already advised.

Liebig affirms, that it is a common occurrence in France, among patients suffering from calculous complaints, that when they go to the

country, where they take more exercise, the compounds of uric acid, which were deposited in the bladder during their residence in town, are succeeded by oxalates in consequence of the increased supply of oxygen. If these views be correct it would seem that country air might be injurious; but the matter cannot be regarded as established.

d. *Calculous depositions of Cystic Oxide, Cystine.*

Depositions of cystic oxide are extremely rare. They are deposited from the urine in a white crystalline state, have a polished surface, and an appearance of crystallization. They are not formed of distinct layers, but appear like a confused mass. The fragments have a particular brightness, and semi-transparency. When exposed to the fire, they exhale a peculiar fetid and characteristic odour; dissolve equally in acids and alkalies; and their combinations with these bodies are capable of crystallizing. The crystals under the microscope, according to Dr. Golding Bird, present themselves under one of the two following forms:—*First.* Tolerably regular six-sided tables, which are sometimes transparent throughout, but more commonly opaque at the centre. *Secondly.* Roundish tables, opaque in the centre, and somewhat crenate at the edges,—a form first described by Dr. Bird. In order to obtain these crystals, the deposit, in which they are suspected to exist, should be washed with boiling water to remove lithates, and any chloride of sodium that may be present. To obtain them from a calculus, some of the powder should be digested in a warm solution of ammonia, and a drop of the clear fluid be suffered to evaporate spontaneously on a slip of glass. It must be borne in mind, however, that curious modifications are presented by common salts, when evaporated either rapidly or slowly from urine, some of these resembling pretty closely the crystals of the cystic oxide. They may be detected, however, by the following characters: they are never opaque in the centre as those of cystic oxide generally are: they do not exhibit colours with polarized light, and they are soluble in water. These calculi, according to M. Guibourt, have not been analyzed more than four or five times. The specimens examined are affirmed to have been all remarkably pure; the cystic diathesis appearing to be followed by the lithic, but by no other. Cystine is considered by Dr. Bird to be a derivative of albumen or of tissues into which it enters; and it would seem to be the result of derangement of the assimilative processes, that are essentially connected with the elimination of sulphur,—every ounce of cystine containing more than two drachms of sulphur. It would seem to be connected with the scrophulous diathesis; and to be disposed to be hereditary.

The cystic diathesis appears to have been most alleviated by a general tonic and revulsive treatment; and muriatic acid, with light tonics and anodynes, seem to have answered best.

e. *Calculous depositions of Xanthic, Lithic, or Uric Oxide, Urous Acid.*

These depositions are also unfrequent; not having been found and examined many times. MM. Marcet and Guibourt have, however, subjected them to analysis. In one case, the calculus was compact, hard, of a lamellated texture, smooth surface, and of a brown colour, similar to that of cinnamon. It fused under the blowpipe, turned brown,

and consumed, leaving a small quantity of white ashes. Subjected to distillation, it furnished a fetid ammoniacal liquor, from which, on cooling, carbonate of ammonia crystallized, and afforded a yellowish oil. Reduced to powder, and boiled in water, it dissolved, and the solution slightly reddened litmus paper. It is dissolved in both acids and alkalies, but more readily in the latter. The solution in nitric acid, evaporated to dryness, left a residuum of a bright citron colour, partly soluble in water, to which it yielded its colour. It is insoluble in alcohol and ether; soluble in very small quantity in acetic acid; and soluble, or nearly so, in oxalic acid, bicarbonate of potassa and saturated carbonate of ammonia. It does not exhibit any crystalline arrangement under the microscope.

The following tabular views of Dr. Golding Bird exhibit the characters of uric oxide as contrasted with those of uric acid, with which it is most likely to be confounded. The chemical composition of the two are extremely similar.

Uric Oxide.	*Uric Acid.*
1. Dissolves slowly, and without any effervescence, in nitric acid.	1. Dissolves readily, with copious effervescence, in nitric acid.
2. The nitric solution leaves, by careful evaporation, a yellow stain.	2. The nitric solution leaves, by evaporation, a pink residue.
3. It dissolves in concentrated sulphuric acid; and the addition of water does not render the solution turbid.	3. It dissolves in concentrated sulphuric acid; and the addition of water produces a copious precipitate of uric acid.
4. Its solution in potassa is not precipitated by chlorohydrate of ammonia.	4. Its solution in potassa is precipitated by chlorohydrate of ammonia.
5. It is precipitated pure and free from alkaline combination, when a current of carbonic acid is passed through its solution in potassa.	5. It is precipitated from its solution in potassa by a current of carbonic acid in the form of urate of potassa.
6. When decomposed by heat, it does not yield any trace of urea.	6. Decomposed by heat, it becomes partly converted into urea.

This deposition is so rare as to be regarded only as a matter of curiosity.

f. *Fibrinous Concretions.*

It is scarcely proper to call these calculi. They have been presumed by M. Guibourt, to be owing to the secretion of albuminous matter under violent irritation of the kidney, but it is more probable, that they are formed by clots of blood detained in the urinary passages. The *fibrinous calculus* of Marcet resembles yellow wax in colour and consistence: its chemical characters are those of fibrin.

Lastly.—A concretion has been described by Dr. Hodgkin, which consists of a series of concentric layers of white elastic substance, like cheese or coagulated albumen, containing between each layer a thinner one of a very friable earthy matter. It can scarcely be considered, perhaps, in any other light than as a fibrinous calculus, with alterne layers perhaps of phosphate of lime.

M. Magendie also describes a species of gravel containing hairs (*Gravelle pileuse*), phosphate of lime, ammoniaco-magnesian phosphate, and a little uric acid. The hair is probably an accidental constituent, and introduced from without.

Such are the chief calculous depositions that are met with.

It may not be amiss to append the following table by Dr. J. W. Griffith, on the effects of reagents on urinary deposits. The characters in the first column, combined with the microscopic appearances, may serve to distinguish one from the other in the absence of opportunities for minute investigation.

Name of Deposit.	Ordinary Colour.	How affected by				Blowpipe upon Platinum Foil.	Characteristics.
		Boiling Water.	Solution of Ammonia.	Solution of Potassa.	Acetic Acid.		
Lithic acid.	Yellowish brown.	0*	0†	Dissolved.	0	Dissipates it entirely.	When evaporated to dryness with dilute nitric acid, and ammonia subsequently added, a pink colour is developed.
Lithate of ammonia.‡	Whitish, pink, brown, and red brown.	Dissolved.	Instantly dissolved.	Idem.	0§	Idem.‖	Idem.
Phosphate of lime.	White, amorphous.	0	0	0	Is dissolved without effervescence.	Unaltered.	Nitrate of silver causes a yellow precipitate in the acetic solution, which is also precipitated by oxalate of ammonia.
Ammoniaco-magnesian phosphate.	White, generally crystalline.	0	0	0. The odour of ammonia is evolved by heat.	Is dissolved without effervescence.	Ammonia is evolved; otherwise unaltered.	Nitrate of silver precipitates the acetic solution yellow: this, however, is not precipitated by oxalate of ammonia.
Oxalate of lime.	White, generally crystalline.	0	0	0	0	Leaves an alkaline ash, which effervesces and dissolves in dilute muriatic acid.	The solution is precipitated by oxalate of ammonia.
Cystic oxide.	White, bluish or greenish.	0	Is dissolved.	Is dissolved.	0	Entirely dissipated.	Crystallizes from the ammoniacal solution on evaporation. When boiled with hydrated oxide of lead, the black sulphuret is formed.
Carbonate of lime.	White.	0	0	0	Is dissolved without effervescence.	Leaves an alkaline ash.	This ash is soluble in acetic acid, and the solution precipitated by oxalate of ammonia.

* 0 signifies no effect.

† Those effects which take place at once or within a few moments only are noticed.

‡ When lithate of soda is present, the reagents mentioned act much more slowly and imperfectly.

§ Acetic acid decomposes lithate of ammonia, and throws down the lithic acid, so that one deposit occupies the place of the other, and no apparent change occurs.

‖ If lithates of soda or lime are present, an alkaline ash is left.

Diagnosis *of renal concretions, both when quiescent, and in their progress to the bladder.*—Calculi of considerable size, may form in the kidney, and yet not be indicated by any diagnostic signs. The ordinary symptoms of chronic nephritis may be present, but nothing to indicate the existence of any concretion. At other times, long-continued obtuse pain is felt in the region of the kidney shooting downwards in the course of the ureter, and, at times, accompanied by numbness in the thigh of the affected side, with painful retraction of the testicle, as in nephritis. These symptoms may be much aggra-

vated, when the patient is exposed to any severe concussions, as by riding on horseback, or in a carriage, over rough roads. Occasionally, too, under such circumstances especially, the urine contains more or less blood; and where the kidney is large, suppuration is generally established sooner or later, and atrophy of the organ results.

When a calculus—even of a very minute size—leaves its situation in the kidney, its course is attended with a series of symptoms, strikingly analogous to the passage of a gall-stone along the biliary ducts. These symptoms are termed, collectively, *Nephralgia calculosa*, *Colica Nephritica*, and *a fit of the gravel*. There is no morbid condition, perhaps, in which the suffering is more excruciating. Pain is generally felt in the region of the kidney, or deep in one side of the abdomen. This may not be severe for a time, and may be obscure, so that, by the feelings, it is difficult to say, whether it is seated in the kidney or ureter, or in the intestines. More or less indescribable uneasiness is, likewise, experienced at the part where the ureter enters the bladder. Along with these symptoms, there may, or may not be, more frequent calls to evacuate the bladder; numbness of the thigh, and painful retraction of the testicle. Soon, the pain augments to a degree that is almost insupportable; continues for a time, and then remits,—to return, however, until the calculus ultimately clears the duct, and attains the interior of the bladder. Associated with the above local symptoms, there may be general disorder. Often, the pulse remains wholly unaffected; but, at other times, there is more or less febrile indisposition. Always, or almost always, nausea and vomiting attend the paroxysm. If the urine be examined, it may be found healthy or high-coloured; and it is at times bloody. When the concretion has reached the bladder, it generally induces a dull uneasiness in the part of the mucous membrane, with which it is in contact. At times, it passes off by the urethra; but, at others, remains for a day or two, exciting a good deal of uneasiness. It rarely, perhaps, happens, that it is retained in that viscus.

From the above detail of symptoms, it is obvious, that the passage of a renal calculus along the urethra might be readily mistaken for an attack of bilious colic; and such a mistake is by no means uncommon. The pain in both is excruciating; and, although the latter is chiefly on one side of the abdomen, and generally accompanied by more or less retraction of the testicle of the corresponding side, and numbness of the corresponding thigh, the last symptoms—as has been remarked—are at times absent, and it may not be until the pain has subsided, and a small concretion has passed, that the true nature of the affection is understood.

Treatment.—When, from the disordered function of the kidney, with pain in the region of that viscus, and the other symptoms described above, there is reason to suspect the existence of a calculus in the kidney, the urine must be examined as to the probable character of the deposition, and the particular remedies—alkalies or acids—be given, according as the deposition is lithic or phosphatic. Cups may likewise be applied to the lumbar region, if necessary, or rubefacients,—as in nephritis. It must be borne in mind, however, that immediately

before unequivocal evidence is afforded of the deposition of calculous matter within the kidney, the urine, which may have previously deposited freely, ceases to exhibit any sediment as it cools, but, in the course of a day or two, sabulous particles become perceptible.

In a severe attack of nephritic colic, the object is to allay the spasm, and in this manner to facilitate the progress of the calculus towards the bladder. Opium may be given freely, so as to induce relaxation, as advised under the head of Gall-stone. Emollient glysters, containing opium, are likewise serviceable, by virtue of their warmth also; and, with the same view, the warm bath may be advised, directing the patient to remain in it for some time. It is rarely necessary to take blood from the general system, but should the symptoms seem to require it, bloodletting may be had recourse to, and opium be given after it. In similar cases, it might be advisable to exhibit nauseating doses of antimonials.

After an attack of gravel, the general functions remain disordered for some time; so that a tonic and alkaline treatment becomes necessary, like that advised under the head of Lithic Depositions from the Urine; and—if practicable—the individual should be directed to travel, in order to enjoy that revulsion, which change of air, society and scenery is capable of affording.

X. INCREASED SECRETION OF URINE.

The quantity of urine, secreted by the kidneys, varies in health, under different circumstances. It is more copious in winter than in summer, and is increased under the operation of diuretics. Its quantity may, however, be so far and so regularly augmented as to constitute a state of disease. Sometimes, this augmentation consists in an enormous discharge of watery urine; at others, of urine containing a large quantity of saccharine matter; and although both these conditions have been described under the head of Diabetes, there is advantage in separating them, as they differ much in their pathology.

a. *Increased Secretion of Watery Urine.*

Synon. Hydruria, Hydruresis, Paruria incontinens aquosa, Hyperuresis aquosa, Urozemia, Diabetes insipidus, D. spurius, Hydrops ad matulam, Urorrhœa, Polyuresis, Diarrhœa urinosa; *Fr.* Diabète insipide, Hypérurorrhée (*Piorry*); *Ger.* Unschmackhafte Harnruhr, Falsche Harnruhr, Harnfluss.

The average quantity of urine, passed in the course of the day, by an adult, may, perhaps, be estimated—as already remarked—at about two pints and a half; but, under particular morbid conditions of the nervous system chiefly, the quantity may be largely augmented, so as to give rise to the affection termed *diabetes insipidus*, in which the urine—as the name imports—is tasteless; a quality that distinguishes it from that of *diabetes mellitus*, which contains a considerable amount of saccharine matter.

Diagnosis.—The affection is characterized by constant desire to evacuate the urine, both by day and night; accompanied, at times, by uneasiness in the region of the kidneys, and by irritation at the neck of the bladder and along the urethra. The urine, in these cases, is almost as colourless as water, but, at times, it is of a very light straw-

colour; and its specific gravity is found to vary from that of spring water—1·001 or 1·002 to 1·008 or 1·010.

Some strange cases are on record, as to the quantity of urine occasionally passed by the kidneys, without disease of those viscera appearing to exist. In one case, described by Morgagni, 42 pints were discharged in a day; and in 93 days, 3674 pints; in another, 40 pints were passed daily; and, in one day, 52 pints; this case occurred in a man. In another, by P. Frank, a young girl, who took only seven pounds of nourishment, voided 36 pints in the twenty-four hours. Many such cases are on record, but one of the most singular has been recorded by Dr. Robt. Willis. It was that of a small artisan, aged 55, who was received into the Hôtel-Dieu, of Paris, to be treated for a bruise on his knee, from which he speedily recovered. His uncommon thirst, and the incessant calls he had to pass his urine, attracted attention, when it was found that, from the age of five years, he had suffered from constant thirst, and been affected with a commensurate diuresis. During the ten days he remained in the Hôtel-Dieu, he consumed, on an average, 33 pints of water daily, often swallowing above two quarts at a draught. The solid food was about one pound and three-quarters, and he appears, also, to have taken a little wine. His evacuations, daily, were about 34 pounds of urine; and, at the most, one pound of fæces. Yet he looked, and seemed to be, well; possessed the ordinary strength of a small man of 55; was the father of several children, and suffered no inconvenience except from the necessity of drinking, and of voiding his urine so frequently. The specific gravity of the urine scarcely exceeded that of pure water: when reduced by evaporation, and yeast was added to it, it gave no signs of fermentation. It seemed to be quite healthy, but very much diluted.

This is one form of diabetes insipidus. Another consists in a very copious discharge of urine, containing an excess of urea—*azoturia*. The urine, in this case, is generally pale and without sediment; and deposits crystals of urea, on the addition of nitric acid, without the aid of concentration. In this form, the symptoms of constitutional disturbance are more marked, in consequence of the formation of an unusual quantity of urea at the expense of the system.

Causes.—A copious secretion of urine is a common accompaniment of the affections to which the epithet *nervous* is usually applied, and, accordingly, of hysteria. The analyses of different observers have differed materially; and it is probable, that the state of the urine commonly varies but little from that of health. The experiments of Dr. Robt. Willis have led him to infer, that the characteristic ingredients are, generally speaking, not essentially altered in their quality or relative proportions, although he found them in very small amount, when their ratio to the menstruum was considered. He was always able to detect urea; and, if any salt appeared to be more abundant than another, it was chloride of sodium. The urine, voided by many nervous subjects in such profusion in the earlier part of the day, he found to be of the same general description as in hysteria. Its specific gravity was sometimes as low as 1·002. In the after part of

the day, however, when the excitability of the frame had passed away, he has found the urine of the same person of a specific gravity as high as 1·033, and containing such an abundance of urea as to yield a plentiful crop of crystals of nitrate of urea, on the addition of nitric acid, without any preliminary concentration. On standing, this urine almost always deposited phosphatic salts; in from twelve to twenty-four hours, it became covered, on the surface, with an iridescent pellicle; and, by and by, its reaction was alkaline, although, when voided, it was acid.

As to the pathological character of this affection, it is evidently not an organic disease of the kidney. It is an augmentation of the natural secretion of the organ; and although secretion—as elsewhere remarked—is not perhaps carried on immediately under the nervous agency, it cannot be doubted, that it is materially influenced thereby; and perhaps, the suggestion of Dr. Willis is at least an approximation to the truth,—that the affection is intimately connected with the nervous temperament. All those who suffered from it, within the sphere of his knowledge, were men of mind, possessed of keen sensibilities, and highly impressible nervous systems.

Compared with the augmented secretion of urine containing a quantity of saccharine matter, to be described presently, this affection is comparatively devoid of danger. Even when urea is separated largely, and the system is debilitated thereby, it rarely or never proves fatal, and may be generally brought within the healthy bounds by appropriate management.

Where urea is copiously secreted, the affection is considered to be allied to those morbid conditions, in which the urine contains albumen or sugar, or deposits the phosphates. But from what has been already observed, it differs from them essentially.

Treatment.—It is not easy to say what remedies are best adapted for the removal of this affection. It would seem clear, however, that agencies, which will direct the flow of fluids towards the cutaneous surface, must be appropriate. Accordingly, warm clothing, with flannel next the skin, the constant use of the flesh-brush, and regular exercise, are likely to prove of benefit. Every agent, that adds to the secretory irritation of the kidney, must be carefully avoided. No saline substances or spirituous solutions must be used; and to allay the excessive thirst, which is generally present, it is better that the patient should take ice frequently, rather than that he should drink even ice-water. If much fluid be taken, the kidneys must necessarily be excited to action, and the morbid condition be kept up. When uneasiness is experienced in the region of the kidneys, cupping should be directed to the loins; and an intermittent irritation, induced by the ointment of tartarized antimony or by croton oil, be established in the same region. Opiates have been strongly recommended, and good effects may be induced by the use of tonics, especially of such as are at the same time astringent. The tincture of the chloride of iron, (ten to thirty drops, three or four times a day, in water,) is a good preparation for this purpose.

b. *Increased secretion of urine containing saccharine matter.*

Synon. Diabetes, D. mellitus, D. verus, Melituria, Phthisuria, Urozemia mellita; *Fr.* Diabète, Diabète sucré, Hypérurorrhée saccharine (*Piorry*), Phthisurie sucrée, Glucosurie; *Ger.* Honigartige Harnruhr, Zuckerhaltige Harnfluss, Honigharnruhr.

Diagnosis.—The diagnosis of this disease does not present any great difficulty. Its principal characters are—a far more copious secretion of urine than natural, which contains a considerable quantity of sugar obtained at the expense of the system; and, therefore, gives occasion to marasmus and death, in the large majority of cases. It may come on suddenly, or in a progressive manner. The copious evacuation of urine may be preceded by pain in the loins, and in the course of the urinary passages. The quantity greatly exceeds that of the fluids and solids taken, however considerable their amount may be. Frequently, fifteen or twenty pints are passed in the course of the 24 hours; and there are cases, referred to by MM. Roche and Sanson, in which forty or fifty, and even two hundred pints, [!] have been voided. There is some reason, according to Dr. Prout, to believe, that in certain cases, a superabundance of dense urine, loaded to excess with urea, may precede the secretion of saccharine urine. The urine in diabetes mellitus is generally pale, colourless, or of a yellowish citron hue; inodorous, sweetish, and even saccharine. It has been generally said to contain no azote, and to be devoid of both urea and uric acid. It would appear, however, from the observations of Messrs. Christison, M'Gregor, and Bouchardat, that urea is generally contained in it in larger relative proportion than in health, but that it is masked by the presence of sugar, and cannot be discovered by the addition of nitric acid, except by peculiar management. By distilling the residue of a given measure of diabetic urine at a temperature a little above that of boiling water, at which the urea is decomposed, it was ascertained by Dr. Henry, from the quantity of carbonate of ammonia evolved, that urea was present in considerable proportion, and by treating the residue of diabetic urine with dilute nitric acid in a flask, and plunging this into a freezing mixture, the average quantity of nitrate of urea, according to Sir Robert Kane, was obtained. Uric acid is generally present, but in small quantity; and hippuric acid has been detected by Messrs. Lehmann, Ambrosiani, Müller and Simon.

The saccharine matter contained in diabetic urine is susceptible of fermentation, and is convertible into alcohol and acetic acid. When it becomes sour, it smells like milk that has turned. The addition of a little yeast, especially if the urine have been previously concentrated by evaporation, causes it to undergo the vinous fermentation. When evaporated to the consistence of syrup, and treated with animal charcoal, &c., it affords a crop of crystals of a sweet substance, which differs not from that obtained from the must of the grape, or from fecula by the action of dilute sulphuric acid. There also remains a considerable quantity of sweet uncrystallizable syrup, analogous in its nature to molasses. The calls to void the urine are very frequent—four or five times or more during the night; and it is not unusually passed involuntarily. This fermentation and the formation of minute confervoid or fungoid vegetations or torulæ must be regarded as

amongst the tests for sugar in the urine, provided it is not in quantity sufficient to be evidenced on evaporating the fluid to the consistence of an extract, and digesting it in hot alcohol, and evaporating so as to produce crystals. The most trustworthy tests, according to Dr. Golding Bird, are first, *Trommer's Test*, which consists in adding to the suspected urine in a large test-tube just enough of a solution of sulphate of copper to communicate a faint blue tint. A slight deposit of phosphate of copper generally falls. Liquor potassæ must then be added in excess; a precipitate of hydrated oxide of copper is thrown down, which redissolves in the excess of alkali, if sugar be present, forming a blue solution like ammoniuret of copper. On gently heating the mixture to ebullition, a deposit of red suboxide of copper falls if sugar be present. Secondly, *Cappezzuoli's Test*, which consists in adding a few grains of blue hydrated oxide of copper to urine contained in a conical glass vessel, and rendering the whole alkaline by the addition of liquor potassæ. If sugar be present, the fluid assumes a reddish colour, and in a few hours the edge of the deposit of oxide assumes a yellow colour, which gradually extends through the mass, from the reduction of the oxide to a metallic state, (suboxide?) *Thirdly, Moore's Test*, which consists in placing in a test-tube about two drachms of the suspected urine, and adding nearly half its bulk of liquor potassæ. The whole is heated over a spirit lamp, and actual ebullition is allowed to continue for a minute or two. The previously pale urine will become of an orange brown, or even bistre tint, according to the proportion of sugar present. This test, according to Dr. Bird, appears to be remarkably free from sources of fallacy, as boiling with liquor potassæ rather tends to bleach nonsaccharine urine than to deepen its colour. Recently, however, a source of fallacy has been pointed out by Dr. G. O. Rees, which consists in this,—that if the liquor potassæ contains lead in solution, it will be united, in boiling, to the sulphur of any albumen contained in the urine, and thus produce a *brown colour*. To guard against this, the liquor potassæ should be kept in a bottle of green glass, which contains no soluble lead, and should be tested with sulphohydrate of ammonia from time to time.

On the whole subject of the tests of diabetic urine, the reader is referred to Dr. Bird on *Urinary Deposits*, Amer. edit. p. 197, Philad. 1845; and Simon's *Animal Chemistry*, Sydenham Society's edition, ii. 194, 297, London, 1846; or Amer. edit. Philadelphia, 1846.

The quantity of sugar varies in different individuals, and in the same individual at different times. In two cases which fell under the author's observation, the amount of solid extract obtained was as much as an ounce and a half to the pint. The average quantity is generally, however, less than this. P. Frank mentions a case in which 52 pounds of urine were discharged during twenty-four hours. According to M. Bouchardat, the average quantity voided in that period amounts to from ten to seventeen pounds. Although passed in such great quantity, diabetic urine is always of considerable specific gravity, ranging between 1·020 and 1·050, and even 1·055; and this obviously dependent greatly on the quantity of saccharine matter which it holds in solution. Dr. Prout, however, affirms, that he has once or twice

seen the specific gravity of saccharine urine as low as 1·015. He has many times observed it at 1·055, and even higher. M. Biot found that it caused polarized light to deviate to the right as a solution of sugar or starch would do. This property, indeed, and the copious secretion of pale urine, greatly increased in density, are regarded—and properly so—by M. Grisolle, as almost pathognomonic symptoms.

The following table, constructed by Dr. Henry, and partly interpolated by Dr. Prout, shows the quantity of solid extract in 16 ounces of urine of different specific gravities from 1·020 to 1·050. The urine was evaporated by a steam heat until it ceased to lose weight, and left an extract which became solid on cooling. The table enables the quantity of solid matter voided by a diabetic patient in a given time to be ascertained with considerable precision.

Specific gravity compared with 1000 parts of water at 60°.	Quantity of solid extract in a wine pint.	Quantity of solid extract in a wine pint.				Specific gravity compared with 1000 parts of water at 60°.	Quantity of solid extract in a wine pint.	Quantity of solid extract in a wine pint.			
	grains.	*oz.*	*dr.*	*scr.*	*grs.*		*grains.*	*oz.*	*dr.*	*scr.*	*grs.*
1020	382·4	0	6	1	2	1036	689·6	1	3	1	9
1021	401·6	0	6	2	1	1037	708·8	1	3	2	8
1022	420·8	0	7	0	0	1038	728·0	1	4	0	8
1023	440·0	0	7	1	0	1039	747·2	1	4	1	7
1024	459·2	0	7	1	19	1040	766·4	1	4	2	6
1025	478·4	0	7	2	18	1041	785·6	1	5	0	5
1026	497·6	1	0	0	17	1042	804·8	1	5	1	4
1027	516·8	1	0	1	16	1043	824·0	1	5	2	3
1028	536·0	1	0	2	16	1044	843·2	1	6	0	3
1029	555·2	1	1	0	15	1045	862·4	1	6	1	2
1030	574·4	1	1	1	14	1046	881·6	1	6	2	1
1031	593·6	1	1	2	13	1047	900·8	1	7	0	0
1032	612·8	1	2	0	12	1048	920·0	1	7	1	0
1033	632·0	1	2	1	12	1049	939·2	1	7	1	19
1034	651·2	1	2	2	11	1050	958·4	1	7	2	18
1035	670·4	1	3	0	10						

The disease is generally attended with voracious appetite, and unquenchable thirst. The skin is dry and harsh; the tongue clammy, and often furred or red, and there is a secretion of thick, viscid saliva. As it proceeds, there is an odour from the body, like that of hay. This odour is strikingly exhaled from the lungs.

It is interesting to remark, as connected with the pathology of this disease, that sugar is not separated alone by the kidneys. It has been found by Mr. M'Gregor in the saliva of a diabetic patient, which fermented briskly when yeast was admitted to it, and complaints are frequently made of a constant sweet mawkish taste in the mouth, and a feeling as if the teeth were set on edge. It has been recently detected, too, in the expectoration of a diabetic patient, by Dr. Francis, of Manchester, England, in the proportion of about 50 grains to the pint. The amount of the expectoration was about a pint and a half daily.

Notwithstanding the quantity of solid and liquid ingesta, usually taken, the system suffers under the excessive secretion of solid and liquid matters, by the kidneys especially. All exertion becomes irksome, and it has been observed, that sexual desire ceases. The temper and disposition always suffer materially, the patient being restless and

dissatisfied with everything around him; the intellectual and moral faculties become daily more and more obtunded; the sleep is incessantly interrupted by desire to drink or to pass the urine; the functions of the stomach are disordered, so that the patient suffers constantly from eructations, borborygmi, sense of weight at the epigastrium, alternate diarrhœa and constipation, &c. &c. Emaciation makes greater and greater progress; the limbs become œdematous; and all the symptoms of hectic fever present themselves, under which the individual untimely sinks to death. A great many intercurrent pathological conditions, which would not affect a sound constitution, often prove fatal; so that—as remarked by Dr. Prout—a diabetic individual may be considered as existing on the brink of a precipice.

The duration of this disease is extremely various. Sometimes, it proves fatal in a few months; at others, it persists for years. It is very rarely cured; and, under such circumstances, it is a happiness that the disease is rare.

Causes.—These are not evident. The disease—according to Dr. Prout—seems to be peculiar to mankind. It appears to attack males more frequently than females, and generally occurs about the middle period of life, although it has been met with both earlier and later. We have not sufficient evidence to pronounce, that any particular constitution or habit of life favours its occurrence. It certainly does not present itself more frequently in the intemperate; for, were it so, it ought to be common in this country, whereas it is extremely rare; yet it has been ascribed by most authors to the abuse of wine and spirituous liquors; and, indeed, by one writer—M. Dezeiméris—to the excessive use of tea, which has been regarded as an excitant drink!

It would appear, that an organization derived from progenitors offers a decided predisposition. The disease has been distinctly traced, through several successive generations. It does not follow, however, that the children of one who has died of diabetes shall necessarily be attacked by it. As in other cases of hereditary predisposition, the malady may be warded off by a careful attention to avoiding the exciting causes. Dr. Robt. Willis knows a family of eight persons, not any member of which has ever shown the slightest tendency to urinary derangement, although the father died of diabetes in its most aggravated shape.

Like most diseases, diabetes has been ascribed to cold; and some have assigned great agency to constant atmospheric humidity. Hence it has been said to prevail to a greater extent in Holland and England, than in many other countries; but this is not established; indeed it has been positively denied by M. Dezeiméris. It certainly would seem to be a more common disease in Great Britain than in this country. In the Royal Infirmary of Edinburgh, it was affirmed, by Dr. Home, during the author's attendance there, that cases of diabetes are in the wards during every medical session; and Dr. B. C. Babington informed Dr. Robt. Willis, that on occasion of preparing to keep an *act* at Cambridge, during his college life, his father, who was then in very full practice in London, had found him opportunities for seeing as many as *twenty-three cases* at one time, in every one of which the

saccharine state of the urine was ascertained. In the annual report of the interments for the city and county of New York, for the year 1839, two cases of diabetes are reported as occurring in males,—one in a person between 30 and 40 years of age, and the other in one between 70 and 80. In the report for Philadelphia, for the same year, there is no case recorded. It is not easy, however, for us to admit, that damp cold can have anything more than a collateral agency, when we are told, that the disease occurs in intertropical countries, and is almost unknown in Russia.

It is manifest, that the causes of diabetes are obscure; and that, thus far, we are enabled to appreciate but very imperfectly the conditions that give rise to it.

Pathological Characters.—The attention of observers was naturally directed to the kidneys in diabetes; and in fatal cases we still look to the condition of these organs in the obscurity of the subject, although there is great reason for the belief, that they are not as much concerned as has been generally believed. No appearance has been observed in them, that can be regarded as uniform. Perhaps the most common has been hypertrophy, although some have mentioned a condition of paleness and anæmia; but this is rarely seen. M. Andral, indeed, affirms, that among the observations relative to the dissection of those who have died of diabetes in the last ten years, there is none, to his knowledge, in which the kidneys presented an anæmic appearance.

The lesions met with elsewhere than in the kidneys are by no means pathognomonic. Occasionally, the great nervous centres have presented morbid appearances, doubtless of an accidental character. Some have affirmed, that the chylopoietic viscera have been found in a state of hyperæmia. In other cases, the stomach has been seen larger than usual; and the mucous membrane thickened, and highly injected. That viscus and the upper part of the bowels have been generally distended with a large quantity of greenish-coloured fluid possessing unusual acidity. The large intestines have been commonly impacted with pale greenish-coloured dry fæces or scybala, not possessing the proper excrementitious odour. The functions of the liver appear to have been always more or less deranged,—the bile having been found to possess an acid, instead of its natural alkaline, reaction; to be of a very pale yellowish colour, and peculiarly fluid; and, in two-thirds of the cases, the disease has been terminated by tuberculosis of the lungs; and, lastly, the body of the patient who has died of diabetes has been observed not to exhale the usual cadaverous smell, and even when laid open, the serous cavities have emitted none of the characteristic odour.

In a case, which the author observed with much interest, the appearances on dissection afforded no satisfactory evidence as to the nature of the affection. There were adhesions of the lungs to the pleura costalis, but these did not appear to be recent; and they are by no means uncommon in diabetic patients. No morbid appearances were observed in the kidneys, although they were carefully examined, excepting an enlargement of the infundibula and ureters; nor was there any evidence of disease about the chylopoietic organs. Under

these circumstances it must be difficult to pronounce as to what is the nature or proximate cause of diabetes mellitus. The increased quantity of urine, and the presence of a large amount of saccharine matter in it are prominent symptoms, which would appear to fix the disease in the organs that secrete the urine; but the augmented secretion of urine is partly accounted for by the unusual quantity of fluid taken to relieve the thirst, which is excessive. The cause of the presence of sugar has been sought for in the condition of the blood, which was affirmed long ago to contain saccharine matter. Chemists, however, of eminence, had failed in detecting it. The negative evidence was suffered by many pathologists to prevail, although it had been observed, that the fluid of transpiration was sweet, which could not have happened unless the blood had contained saccharine matter, or the elements from which it might be formed. Of late, however, respectable chemists,—Messrs. M'Gregor, Bouchardat, Simon and Rees,—have boldly asserted, that they have unequivocally discovered it in the blood. To obtain diabetic sugar, the serum was coagulated by Mr. M'Gregor, and carefully dried by heat. The solid mass, being divided as minutely as possible by a pair of scissors, was boiled in water, and the decoction having been filtered through paper, was evaporated to a certain extent. The concentrated liquid on the addition of yeast fermented strongly for several hours. Not satisfied with these results, and desirous of tracing the presence of saccharine matter still farther back, Mr. M'Gregor instituted several experiments, from which he is led to infer, that the stomach in diabetes, forms a preternatural proportion of sugar, and that the admission of the saccharine matter into the chyliferous vessels, and the consequent presence of a material in the blood, which is foreign to its healthy composition, is the cause of the different morbid phenomena of diabetes;—the kidney merely separating—as the great depuratory organ—the foreign material conveyed to it from the blood. Many modern observers believe with Mr. M'Gregor, that the proximate cause of the disease is in the stomach. If, however, we grant, that the stomach forms an inordinate quantity of sugar from the food, it is not easy to see how the sugar escapes the action of the stomach and of the chyliferous vessels, which appear to reduce all alimentary matters to their elements, and to recombine them so as always to form the same fluid—chyle—from the heterogeneous materials subjected to them. The disease must exist, likewise, in those vessels of selection. The author is, indeed, disposed to refer it to the whole system of nutrition; saccharine matter being formed not only by the chyliferous vessels, but by the lymphatics, in every part of the economy, at the expense of the system; so that emaciation supervenes, if not wholly, in part, from this cause, rather than from the irritation produced by the saccharine matter itself on the system of nutrition.

M. Bouchardat directs attention to the fact, that the presence of sugar in the blood can only be incontestably proved when bloodletting has been performed two or three hours after dinner; and that if it be performed in the morning no traces of it can be found; and M. Simon corroborates this observation.

Treatment.—In the obscurity of the precise pathology of diabetes, the treatment has also been obscure, and has varied according to the par-

ticular views embraced by the therapeutist. Where the disease has been considered to be seated essentially in the kidney, remedies have been directed to that organ; and where the mischief has been referred to the stomach, that viscus has been the chief object of attention. "Could we discover," says a recent writer,—Dr. Robert Willis,—whose views lead him to term the affection *dyspepsia saccharigena*,—"any means of preventing the stomach from forming sugar, we should, I believe, succeed in curing the disease." With the views which the author embraces, he cannot believe, that the stomach is the main organ to which attention should be directed. The disease—as before remarked—appears to be seated in the whole system of nutrition; and, therefore, remedies that are addressed to the whole system, and which are adapted for modifying the function of assimilation generally, seem to be clearly indicated. Frequently, there is a feverish condition, which is benefited by bloodletting; and, under its employment, the quantity of saccharine matter in the urine—as might have been imagined *à priori*—is diminished. Opium has had the same effect, and has been largely administered, to the extent, indeed, of inducing narcosis,—and, in one case, which the author had an opportunity of witnessing, a question arose, whether the fatal results were immediately owing to the disease, or to the remedy, or to both combined. Where this valuable therapeutical agent appears to be indicated, it may be given as in other morbid conditions; but there is no reason for believing that it exerts any special beneficial agency in diabetes. Under the author's view, revellents would appear to be most clearly indicated. Occasional emetics and cathartics, the use of warm clothing,—as of flannel next the skin,—and the warm bath, a thorough change of diet, with travelling air and exercise, will break in upon the disease, if any agents be capable of so doing.

Almost all therapeutists have advised, that the patient should be restricted to animal food, under which—it has been affirmed—the proportion of saccharine matter in the urine has diminished. It is reasonable, indeed, to suppose, that vegetable food, consisting only of the three elements—oxygen, hydrogen, and carbon—which enter into the constitution of sugar, should be more readily converted into sugar than animal food, which consists of four elements—oxygen, hydrogen, carbon, and azote; but on the other hand, a like diminution in the quantity of the saccharine matter has been perceived, when the patient, after having been accustomed to a mixed diet, has been restricted to vegetables; the benefit, in both cases, being probably more dependent upon change than upon the particular diet to which the patient has been subjected.

It is not necessary—indeed, it would be an idle waste of time—to enumerate the various articles of the materia medica, that have been administered empirically in diabetes mellitus; some on reasons which have weight, but others on no solid foundation. Thus, it has been suggested, that "from the effects of acetate of lead, in restraining active hemorrhage, and other discharges, it may be found useful in diabetes, and is, therefore, worthy of trial," and, in like manner, the employment of various other astringents, as alum, tannin, and creasote,

have been advised. It need scarcely be said that no identity exists between active hemorrhage and the disease under consideration; and, consequently, that the agents in question have been advised on a false analogy. So far as they are capable of entering the mass of blood and modifying the condition of that fluid, and, through it, of the system of nutrition, they may be serviceable; but their agency in this respect is limited; and they are, in reality, entitled to but little confidence. Three cases have been published, by Dr. C. Clay, in which the tincture of chloride of iron, according to the following formula, is said to have been found beneficial.

R.—Tinct. opii f℥iss.
—— ferri chlorid. f℥ij.
Quiniæ sulphat. gr. viij.
Aquæ destillat. f℥vj.—M.
Dose, an ounce, three times a day.

Dr. George H. Barlow, who believes that the sugar is formed in the primæ viæ, and is not necessarily connected with a perverted action of the kidneys, considers, that there are two great indications to be laid down in the treatment of diabetes,—*first*, the avoidance of all saccharine and amylaceous aliments; and, *secondly*, the introduction into the stomach of a highly azotized substance, which is at the same time a diffusible stimulant, in order to exalt, if possible, the assimilating powers of the organ. Both of these ends, he thinks, are likely to be attained by ammonia. Dr. Barlow found, that under the use of the carbonate of ammonia, the function of the skin was generally restored; and although he sometimes thought, that it was aided by opium in effecting this; yet in some cases the same result was produced without the use of the latter. He prescribed it in the dose of from five to eight grains and upwards, with a few minims of tincture of opium in some bitter infusion, every six hours,—animal diet with greens being given at the same time. This plan appeared to be beneficial in some cases; but Dr. Barlow is far from affirming, that the remedy will prove a certain cure for all cases of the disease.

Under similar views to those mentioned above, and believing, that the water drunk by diabetic patients in such abundance is not usually more than is necessary to effect completely, by means of the diastase, the transformation of the fecula into sugar, M. Bouchardat considers, that but little more is requisite than to withhold as far as possible all fluids, and articles of diet containing sugar or fecula. His researches have led him to infer, that in diabetic patients the thirst is in a direct ratio with the quantity of saccharine or feculent food taken; and that the proportion of glucose contained in the urine is in constant relation with the proportion of such food taken.

Bread, as an article of diet, has appeared to many observers to exert an injurious influence; and accordingly, if any be permitted, it should be gluten bread, or bread containing but a small proportion of starch.

M. Simon had an opportunity for testing the excretions of a diabetic patient under different methods of management. No. 1, represents the constituents of the urine before the commencement of animal

diet; No. 2, shortly after its commencement; No. 3, during the same diet, and shortly before the use of codliver oil; No. 4, after the oil had been taken for eight days; No. 5, after the iodide of iron had been taken for eight days; No. 6, after gluten-bread had been taken for eight days; and No. 7, two days afterwards; there being a considerable increase in the secretion.

	No. 1. 4½ quarts.	No. 2. 3 quarts.	No. 3. 4 quarts.
Specific gravity,	1037·1	1038·9	1029·7
Solid constituents,	14·5 oz.	9·9 oz.	10·0 oz.
Sugar and extractive matter,	12·5	7·5	8·5
Urea,	3 drachms.	5 drachms.	7 drachms.
Uric acid,		5 grains.	8 grains.
Fixed salts,			6 drachms.

	No. 4. 4 quarts.	No. 5. 4 quarts.	No. 6. 3½ quarts.	No. 7. 4½ quarts.
Specific gravity,	1030·2	1030·4	1032·37	1032·97
Solid constituents,	10·5 oz.	10·5 oz.	10·2 oz.	12·5 oz.
Sugar and extractive matter,	8·9	7·25	8·1	9·6
Urea,	7 8 drs.	10·0	1·1	1·3
Uric acid,	10 grs.	—	5 grs.	15 grs.
Fixed salts,	6 drs.	8 drs.	6·8 drs.	1 oz. 9 grs.

M. Simon observed, that the composition of the urine appears to undergo a rapid modification as soon as there are decided indications of convalescence. The sugar decreases to a very great extent, and is replaced by albumen—a substance of frequent occurrence at the commencement of the disease, and apparently alternating with the sugar.

c. *Increased secretion of Milky Urine.*

Synon. Diabetes chylosus, D. lacteus, Chyluria, Galacturia, Pyuria lactea, P. chylosa, Cœliaca urinalis, C. renalis, Chylorrhœa urinalis, Ch. renalis, Fluxus cœliacus per renes, Chylo-serous urine; *Fr.* Diabète chyleux; *Ger.* Milchharnen.

A milky appearance of the urine is occasionally observed, without there being any evidence of renal or vesical mischief. Formerly, it was universally believed to be owing to chyle being discharged with the urine; and the researches of a distinguished modern chemist, Dr. Prout, have shown, that it contains principles analogous, if not identical, with those of the chyle, hence its name, *chylous urine*, and *chylo-serous urine*. The urine is generally copious; but, at times, the quantity is not greater than natural, and it generally varies from 1·010 to 1·020. After it has been discharged for a short time, it sometimes coagulates into a gelatinous body, like *blanc-manger*, and, afterwards, gradually separates into a clear, yellowish fluid, and a white clot; at other times, a white flaky matter is deposited, without general coagulation of the mass; and, at others, again, a white homogeneous substance rises to the surface, like cream. The matter, which separates in all these shapes, appears to approach fibrin or casein in its characters, and to bear a resemblance to the white coagulum of chyle. The urea is always found to be deficient, but is never altogether wanting.

The peculiarities of this kind of urine are said to be best marked a few hours after a meal: and they are apt to be removed temporarily by inflammatory action, or by ptyalism from mercurials.

The causes of this condition are by no means apparent. It has

been met with in both sexes, and at all ages; and a considerable proportion of the cases is said to have occurred in persons who had been a good deal in hot climates. It does not appear to be always accompanied by derangement of health; but, at times, the general symptoms strongly resemble those of diabetes mellitus.

In regard to the nature of the affection, nothing decisive is known. The excellent chemical pathologist, already cited, who has had an opportunity of seeing more or less of thirteen cases, is led to suppose, that the chyle from some derangement in the process of assimilation is not raised to the blood standard; and, consequently, being unfit for its purposes, is agreeably to a law of the economy ejected through the kidneys; but these organs, instead of disorganizing or reducing it to the crystallized state as usual, (that is to say, instead of changing it into lithate of ammonia,) permit it to pass through them unchanged. "That this is a just view of the matter"—he adds—"cannot, I think, be doubted; for if the chyle was properly converted into blood, not chyle but blood ought to be thrown off by the kidneys." It has not been established, however, that the blood is chylous, which ought to be the case, were the presence of chyle in it the cause of the appearances in the urine; and it is remarked as not a little strange, that although blood has been drawn several times in the disease, no one has hitherto taken any notice of its appearance or properties.

Where a fatal termination has taken place in the course of the affection, death has arisen from some acute internal inflammation; and no morbid appearance whatever has been discoverable in the kidneys.

Treatment.—It is difficult to suggest any philosophical mode of meeting the disease. Should evidences of excitement present themselves, they must be reduced by appropriate antiphlogistics. Counter-irritation, by means of a seton, has done some good at first; but the system has speedily become accustomed to it. It is a consolation, however, that the constitutional disturbance—as before remarked—is often exceedingly slight, or null; and that a person may be affected with it for years, without the system appearing to suffer. In such cases, it ought not to be interfered with; especially as we know of no rational means for removing it.

XI. SUPPRESSION OF URINE.

Synon. Paruria inops, Paruria retentionis renalis, Anuria, Ischuria notha seu spuria (of some), Suppressio urinæ, Ischuria renalis; *Fr.* Suppression d'uriné; *Ger.* Harnverhaltung.

Dr. Good has given the name *Pururia inops* to "destitution of urine, without desire to make water or sense of fulness in any part of the urinary track;" and *Paruria retentionis renalis* to stoppage of urine, accompanied by "pain and sense of weight in the region of the kidneys, without any swelling in the hypogastrium." In the former case, the urine is not secreted by the kidney; in the latter, it is, but does not from some cause descend the ureters. The former is the *Ischuria notha* seu *spuria*, *Suppressio urinæ*, of many authors; the latter, the *Ischuria vera* or *Ischuria renalis*, of many. It is chiefly to the former,

or suppression of urine from want of secretion by the kidneys, that attention will be directed here.

Diagnosis.—The urine is known to be suppressed, by the absence of the fluid in the bladder, when the catheter is introduced, or of any evidences of distension of that organ, or of a desire to pass the urine. Generally, it is a most alarming symptom, and commonly presents itself in the worst forms of certain diseases, as cholera Asiatica, in which it indicates the complete morbid change that has taken place in most important functions. Yet, although the suppression of this depuratory secretion is generally of fatal import, cases are on record in which it has persisted for several days, and the person has recovered; nay, there are some in which it has been arrested for weeks, and the case of a youth, 17 years of age, is recorded, who had never passed urine in his life. This, however, was owing to malformation; and it is not improbable, as has been suggested by Dr. Willis, that the ureters terminated in the intestinal canal, so that the urine and fæces were passed together as in birds and the monotremata.

It has been affirmed, too hastily, by a distinguished physiologist, M. Adelon, that the secretion of urine cannot be arrested for three days without death resulting. In addition, however, to the cases already given, and others that might be brought forward, allusion may be made to one published some years ago by M. Doring, in which death did not take place until the expiration of twelve days, during which time there was no secretion, renal or vicarious. Not long ago, the author had under his care a young gentleman, labouring under melancholia—characterized by all the resistance to ordinary influences, which belongs to that form of insanity—in whom the urine had certainly not been discharged for ten days; yet the quantity, ultimately voided, was by no means large, so that the daily secretion from the kidneys must have been greatly diminished, if not arrested.

When the functions of the kidneys are not exercised for a length of time, other portions of the economy—it has been affirmed—may take upon them the depuratory office, and large quantities of urinous fluid may be discharged by vomiting, or by the cutaneous exhalents. Experiments on animals have exhibited, that when the kidneys are extirpated, urea or the matter of urine—*Harnstoff* of the Germans—can be detected in the blood. It is not astonishing, then, that a urinous character should be given to many of the secretions, which are necessarily derived from the blood. It can be understood, too, that the presence of matters in the blood, which ought to have been thrown off from the economy in the process of depuration, may act injuriously upon the vital organs,—that the functions of the brain may be interfered with, and coma be produced by the presence of urea, as it is by that of bile, in the blood. In such cases, an unusual quantity of serous secretion has been found within the cranium, in which the odour of urine was distinctly perceptible. Frequently, a decided urinous taste has been perceived by the patient; and the cutaneous transpiration has been markedly urinous.

Although ischuria is occasionally symptomatic of serious and fatal disturbance of the general functions, it may arise as a local disorder

of the functions of the kidney. It is then said to be characterized, along with the symptoms before enumerated, by dull pain or sense of weight in the lumbar and iliac regions, with great anxiety, nausea, vomiting, hiccup, cramps, general irritability and restlessness, and sometimes delirium, lethargy, and coma; these symptoms, however, are accompaniments, whether the suppression begin in the kidney or be symptomatic of general disorder. Very frequently, a partial secretion is effected, and it has been remarked, that a very small amount of urinary depuration is sufficient for the wants of the system, whilst the total cessation of the secretion for any length of time is almost uniformly fatal.

Causes.—These are not always clear. Like other diseases, and in the obscurity of the subject, it has been referred to exposure to cold. It may certainly be induced by mechanical injuries, either external, or from causes within the body. Thus, it is known to have been caused by calculous irritation of the kidneys. When one kidney is affected, the other may still accomplish the secretion; but it is apt to assume the same kind of irritation sympathetically; and, in this way, the secretion may be arrested from both simultaneously.

It has been suggested, that suppression of urine may supervene upon blennorrhœa when the discharge has been suddenly checked, but the occurrence must be rare. It would appear, too, to have been witnessed as secondary to some intestinal or cerebral disease.

Pathological Characters.—These have been various. Usually, perhaps, the kidneys have presented evidences of inflammatory action. They have been of a redder colour than natural; and, at times, their substance has been drier and firmer than in the healthy state. Where the suppression has been dependent upon calculous deposits, these will of course be found in some part of the kidneys. Still, the morbid appearances throw no light on the nature of the disease. It is an abolition of the secreting power of the kidneys, but how induced we know not.

Treatment.—In our ignorance of the pathology of this affection, it is impossible to lay down any precise method of treatment. Should there be any evidences of nephritis, the appropriate management, inculcated elsewhere, must be adopted. Cupping, especially—combining, as it does, depletion and revulsion—should be prescribed, and repeated according to circumstances.

If this plan of treatment be generally right, it is difficult to see how the stimulating diuretics can be beneficial, as they cannot fail to irritate organs, whose vital manifestations are probably already exalted. It has been advised to apply a succession of large blisters on either side of the fleshy mass constituting the sacro-lumbales muscles. Cathartics with the warm bath and the free use of diluents may likewise be recommended. Such would seem to be a rational mode of treatment, and accordingly it will be found the most successful. Usually, the routinist, who looks only to the deficiency or total absence of the secretion, has recourse to excitant diuretics,—as cantharides, which have, indeed, been esteemed a kind of specific in ischuria. It need scarcely be said, that they should be used with much caution, and

never where there is reason to presume the existence of nephritis. The same may be said of the terebinthinates, which have been highly extolled.

Narcotics, as opium and tobacco, have been administered in some cases, and it is said with benefit; but it is idle to attempt to lay down precise rules, where—after all—so much must be left to the discretion of the physician.

It has been properly remarked, that when the urine is nearly suppressed, in long-continued organic disease of the kidneys, no remedial measures will restore its quantity; and if once coma have fairly set in, the case is all but hopeless.

SECTION II.

DISEASES OF THE URETER.

The excretory duct of the kidney is not liable to many diseases; and, therefore, it will not be necessary to say much in this place. It may be attacked by inflammation—*Ureteritis*—and the symptoms may be somewhat equivocal. Usually, along with the ordinary evidences of internal inflammation, there is deep-seated pain on pressing along the course of the ureter: these symptoms may or may not be accompanied by great irritability of the bladder, of a symptomatic character; and similar to that, which is so common a concomitant of renal disease. In a case, which the author attended not long ago, the pain was referred chiefly to one groin,—spreading, however, towards the linea alba; and there was a somewhat diffused, hard tumefaction, which was very tender on the slightest pressure being exerted. Under leeching and poulticing, the excessive tenderness gradually diminished, and, in about ten days or a fortnight from the commencement of the attack, pus was copiously discharged along with the urine. In this case, there was much obscurity of diagnosis;—no uneasiness was felt in the region of the bladder; and the author was rather disposed to suspect the existence of typhlo-enteritis. The result proved, that the ureter was the seat of the disease. The patient recovered. The author has met with three or four cases of the same character, in which equal obscurity existed in the diagnosis; but where the weight of evidence was in favour of the presence of inflammation of the ureter. This may supervene on common causes, like inflammation of other internal organs; but the most probable cause is calculous or other depositions lodging in the channel, and obstructing or irritating it.

Where any substance is arrested in the ureters, the duct above the obstructed portion sometimes becomes very largely distended: both the ureters have, indeed, been observed as large as the small intestines. It is obvious, too, that any tumour pressing upon the ureter may lead to the same result. In these cases, the parietes of the duct become occasionally extremely attenuated. On the other hand, any source of irritation in those ducts may lead to modification of nutrition, and to stricture, owing to morbid depositions in the parietes.

During pregnancy, severe pain is occasionally felt in the course of the ureters, leading up to the kidney, which has been attributed to *spasm of the ureters*. It has been suggested by Dr. Churchill, as probable, that it arises from pressure upon the ureters as they pass into the pelvis, and that the same effect may possibly be caused by a dyspeptic state of the stomach. The attack is purely local, consisting of severe and sometimes intermitting pain, with distressing strangury, which may cause abortion, if not relieved. The most appropriate treatment consists in the revulsion produced by purgatives, followed by full opiates. The pain is also removed, at times, by change of posture.

SECTION III.

DISEASES OF THE URINARY BLADDER.

I. INFLAMMATION OF THE BLADDER.

Synon. Cystitis, Empresma Cystitis, Inflammatio vesicæ, Cystiphlogia, Cystitis urica, Urocystitis; *Fr.* Cystite, Inflammation de la vessie; *Ger.* Harnblasenentzündung, Entzündung der Harnblase.

Inflammation may attack the peritoneal coat of the bladder, or it may affect the mucous coat more especially. In either case, the disease may extend to the muscular coat, so that all become implicated. Commonly, however, the inflammation is seated in the mucous coat, mainly; and, as in inflammation of the mucous membranes in general, after it has existed for some time, the secretion of mucus, which had been arrested at the commencement of the inflammation, becomes augmented in quantity, and modified in quality; so that the disease, especially in the chronic form, has—from this symptom—taken the names—*Cystorrhœa*, *Catarrhus vesicæ*, *Blennorrhœa vesicæ*, *Blennuria*, *Ischuria cystophlegmatica*, *Tenesmus vesicæ mucosus*, *Paruria stillatitia mucosa*, *Dysuria mucosa*, *Pyuria mucosa*, *Catarrhal inflammation of the bladder*; Fr. *Cystite muqueuse*, *Catarrhe de la vessie*, *Flux muqueux de la vessie*; Ger. *Blasenkatarrh*, *Blasenschleimfluss*, *Blasenblennorrhoë*.

Diagnosis.—The general symptoms of inflammation of the bladder are the following:—More or less pain is first experienced in the hypogastrium, immediately above and behind the os pubis, which is augmented by pressure, moving the body, the contraction of the abdominal muscles, coughing, sneezing defecation, and by efforts to pass the urine. More or less tension and tumefaction is generally also perceptible in the hypogastric and perineal regions. The patient suffers from perpetual calls to pass the urine, and the effort is always extremely painful and ineffectual,—a few drops only flowing, with great suffering. The smallest drop passes with a sensation of burning heat; and, not unfrequently, the efforts are wholly ineffectual. This perpetual desire has been termed, by some, *Tenesmus vesicæ*. Under these circumstances, the bladder becomes gradually distended; the tumour above the pubis is manifest, and extremely painful to the touch; and the pain extends to the kidneys, perineum, rectum, and, indeed,

over the whole abdomen. During the first days, the urine which is passed does not present any unusual appearance. The first effect of inflammation on a mucous membrane being to diminish or arrest the secretion, no mucus is perceptible in the urine; but, subsequently, the urine generally presents a modified colour, is turbid and reddish, and deposits, on cooling, a quantity of glairy and ropy mucus, similar to white of egg, which can be readily elevated through the fluid upon a rod of twigs, or on the feather of a quill. The rapid tendency to alkalinity, in consequence of the formation of carbonate of ammonia, gives occasion to the deposition of the earthy phosphates, especially of crystals of ammoniaco-magnesian phosphate, which become mixed with the mucus.

When the disease is but slight, there may be no marked signs of general irritation, and the symptoms gradually yield; but when the inflammation is to a greater degree, or, if the other coats of the bladder be implicated, there is always more or less heat and dryness of skin, and other symptoms of pyrexia,—as dryness of the mouth, nausea, vomiting, with frequency and hardness of pulse, which becomes afterwards small and contracted. In certain cases—it is affirmed—instead of dryness of the skin, copious sweats supervene, which have a urinous odour.

Cystitis may terminate by resolution or by suppuration. In the latter case, pus may form in the parietes of the organ, and break into the cavity of the pelvis, causing fatal peritonitis; or it may penetrate the rectum, uterus, or intestines. The most fortunate termination is by communication with the interior of the bladder. In certain cases, the pus, which is discharged with the urine, would appear to be the product of the inflammation of the mucous coat,—*Ulcera* seu *Helcosis vesicæ;* Ger. *Harnblasengeschwüre.* The termination by gangrene is extremely rare.

The blood of a man suffering from cystitis was analyzed by MM. Andral and Gavarret, and found to consist of water, 785·8; fibrin, 5·4; blood corpuscles, 111·4; solid residue of serum, 97·4;—the increase of fibrin and diminution of corpuscles showing, that the blood was similar in its constitution to that of other inflammatory diseases.

When acute cystitis is succeeded by the *chronic form*, the signs of activity of circulation, and the heat and tension of the hypogastric and perineal regions diminish; the calls to evacuate the bladder, and the pain and heat during the passage of the urine are much less urgent; but the characteristic appearances of the mucus in it are more or less abundant. When a catheter has been introduced into the bladder under such circumstances, great difficulty has been experienced, and intense suffering. In certain cases, the urine exhales an insupportable odour.

Chronic cystitis may endure for a considerable period, but where there is ulceration it very generally terminates in marasmus and death, —*Phthisis vesicalis, Cystophthisis;* Ger. *Blasenschwärsucht.*

Causes.—The causes of cystitis are not always clear. As in other cases of internal inflammation, it has been ascribed to cold; but, more commonly to mechanical or chemical irritants, affecting the bladder

directly or indirectly. When that organ generally is inflamed, it may be owing to penetrating wounds, the operation of lithotomy, the long and painful use of the catheter, falls and blows on the hypogastrium; or to a laborious parturition, in which it has been long and severely pressed against the pubis by the head of the child, or injured by the instruments of the obstetrician. Internal irritants—as stimulating diuretics, and especially cantharides, may likewise induce it; and it is affirmed to have supervened on the suppression of an habitual hemorrhage, an old issue, and after the retropulsion of gout or some cutaneous exanthem. It would seem, likewise, to have been induced by sympathy of continuity or contiguity in the progress of inflammation primarily affecting the peritoneum, uterus, rectum or urethra. Of the extension by continuity, frequent examples occur in cases of blennorrhœa.

Calculi in the bladder more frequently, perhaps, give rise to cystitis of the mucous coat, but they may induce inflammation of all the coats of the viscus. This occurs occasionally, where large or numerous calculi exist in the bladder, and the patient has been compelled to ride a considerable distance over rough roads, or in a carriage badly suspended.

Inflammation of the mucous coat of the bladder may attack all ages, but it has been more commonly met with in elderly individuals, in whom, and, indeed, in all cases, it is favoured by stricture of the urethra, and by every obstacle to the free discharge of the urine.

A form of cystitis has been described in gouty individuals, in which the inflammation assumes the latent character, and which is consequent upon an attack of irregular gout. It is preceded by rigors, followed by febrile exacerbations, which gradually increase in severity, until, at length, irritative fever of the most formidable kind is established, attended with extreme prostration, oppressive nausea and vomiting, but, for a long time, without any urinary complaints. At length, retention of urine occurs to a greater or less extent, and the external organs become tumid, after which the patient rapidly sinks. The urine does not appear to deviate from the normal condition.

Pathological Characters.—When the substance of the bladder has been inflamed for a short time only, and the disease has terminated by resolution, there may be no trace of the previous inflammation. When it has been chronic, the parietes of the bladder have been found thickened, and, in some cases, where it has persisted for a long time, the mucous membrane is thickened generally, and the muscular coat is everywhere hypertrophied. Where the disease has terminated in suppuration, traces of the abscess may be found separating the fibres of the muscular coat from each other, and greatly thickening it; or pus may be found collected into an abscess, or poured into the cavity of the peritoneum or elsewhere. False membranes, free or adherent, may be seen on the mucous coat of the bladder, and it is their expulsion by the urethra, which has given rise to the idea, that the mucous membrane may be entirely detached and expelled with the urine. The hypertrophy of the muscular coat is sometimes so great that it is an inch thick. Under such circumstances, it is of a red colour,

although it may be at the same time infiltrated with pus, as it was in one of three cases recorded by M. Velpeau. In other cases, the coats of the bladder are found to be thinner than usual, pale, and to have lost their consistence,—a change which is most frequently observed in the mucous coat.

Where the inflammation has affected chiefly the mucous coat, more or less redness may be perceptible, confined to particular parts or diffused over its whole surface. Where the disease has been chronic, the organ is usually diminished in size, and contracted; but at times it is distended with fetid urine, mixed with blood or purulent matter; its parietes are thickened, the internal surface is of a reddish-brown colour, and a network of vessels is often seen developed, similar to varicose veins, and, according to M. Martinet, particularly resembling the venous plexus that surrounds its neck. When the bladder is much contracted, it is generally greatly furrowed; the mucous follicles are developed; and, when they are pressed between the fingers, a mucous fluid oozes out similar to that deposited by the urine. Ulcerations of the mucous membrane are likewise frequent, and, in such case more pus than mucus is found in it.

Treatment.—In the acute and active forms of cystitis, powerful antiphlogistics must be prescribed. Bleeding from the arm to diminish the amount of stimulus in the vessels, must be had recourse to, and be repeated should the symptoms demand it: even when doubts may exist as to the propriety of general bleeding, it may be advisable to apply leeches over the hypogastric region; and after they have fallen off, a large emollient poultice may be placed over the leech-bites. The patient should also be kept, for some time, in the warm bath, and especially in the warm hip bath; and a bladder half-filled with hot water, or fomentations may be applied to the region of the bladder. With similar views, warm emollient injections may be repeatedly thrown into the rectum, and, if the pain be very great, the *tinctura opii*, (gtt. l.—lxxx.) may be added to the enema. At the same time, the patient should be kept on the use of demulcent or diluent drinks, in small quantity only; and remain in bed, and in the horizontal posture.

It is a common opinion, that the catheter should be introduced as soon as possible. This has, indeed, been esteemed by Dr. Mackintosh a principal remedy; and to be serviceable, not only by drawing off perhaps a large collection of water, thereby relieving distension, but sometimes by removing a small quantity of acrid, high-coloured urine, by which the patient's sufferings are immediately mitigated. It has been a matter of dispute, however, whether it is better to leave the catheter in the bladder, or to introduce it afresh, when occasion arises. The best method, perhaps, is to retain the instrument in its place, when it does not occasion any aggravation of the symptoms, or if great pain and irritation be produced by its introduction. On the other hand, if the urethra be unaffected and of considerable diameter, and the obstacle appear to be seated altogether in the neck or orifice of the bladder, the instrument need not be kept in. It is hardly necessary, however, to say, that whenever the catheter can be dispensed with, it

ought to be,—as under the most favourable circumstances, it can scarcely fail to irritate a surface already highly inflamed.

The plan of treatment adopted for general cystitis is equally applicable to the catarrhal form when it is acute. It is the *chronic* form, however, which most frequently, perhaps, falls under our attention, and requires a modified plan of treatment. The same difference, indeed, exists between the therapeutics of the acute and chronic varieties as between those different conditions of other mucous membranes. In all cases, the causes of the cystitis must be closely inquired into; and if the disease appear to be connected with stricture of the urethra, calculous concretions of the bladder, &c., the patient must be subjected to a treatment adapted to such cases. Where no such manifest cause exists, the main management should consist in revulsion. Bleeding from the arm can be rarely required, but cupping over the perinæum and hypogastric region, repeated according to circumstances, will be found to afford decided relief. The warm bath, and especially the warm hip bath, and fomentations and emollient injections—as advised under the acute form—will also be highly advantageous in this. Amongst the revellents that have been extolled in this disease, are blisters to the loins or sacrum, or the upper part of the thighs or hypogastrium,—or the ointment of tartarized antimony to the same parts. A seton has likewise been inserted in the hypogastric region with excellent effects.

Under this treatment, assisted by the use of demulcent food, and gentle laxatives, as castor oil; by warm clothing, and mental and corporeal quiet, the disease generally becomes greatly ameliorated; a state of blennorrhœa or gleet may remain, however, after all manifest signs of inflammation have passed away, and—as in other cases of chronic inflammation of mucous membranes—may demand an opposite plan of treatment from that which is indicated in the more inflammatory period. Under such circumstances, the various mineral and vegetable tonics have been freely given. Cinchona, colomba, and gentian have been most commonly employed, and they are capable of fulfilling all the objects with which the articles of the class are administered.

Of astringents, some have been supposed to act more particularly on the urinary organs. Of these, the most prominent are diosma and uva ursi. The author has frequently administered these agents, but he has had no reason to believe, that they exert any such special agency. They are tonic astringents, and, as such, may be beneficial.

℞.—Diosm. seu
Uvæ ursi fol. ℥ss.
Aquæ Oss.—M.
Dose, two or three tablespoonfuls, three times a day.

A decoction of pareira brava, made by boiling half an ounce of the root in three pints of water, reduced by gently simmering near the fire to one pint, is highly extolled by Sir Benjamin Brodie. Of this, the patient takes from eight to twelve fluidounces daily. The author's experience with this article has not induced him to place a higher value upon it than upon diosma and uva ursi. (See his *General The-*

rapeutics and *Materia Medica*, 3d edit. i. 297, Philad. 1846.) Copaiba, cubebs, and turpentines have likewise been advised, and it is said with benefit. Copaiba and turpentine may be given in the form of pills, or of emulsion; and cubebs in that of electuary.

℞.—Cubeb. pulv. ℥ss.
Mellis despum. q. s.—M.
Dose, a teaspoonful, three or four times a day.

Turpentine, with the catheter kept constantly in the bladder, comprised the treatment usually advised by M. Dupuytren at one time.

Of mineral excitants and astringents, the preparations of iron are perhaps the best when given internally. Of these, the *tinctura ferri chloridi*, (gtt. x. ter die ex aquâ.) the *liquor ferri persesquinitratis*, (gtt. x. ter die ex decoct. hordei,) and the *ferri iodidum*, are to be preferred.

℞.—Ferri iodid. gr. xxiv.
Aquæ destillat. f℥j.—M.
Dose, a teaspoonful, three times a day.

Where the disease is manifestly connected with an atonic condition of the parietes of the bladder, the catheter or *sonde à demeure* becomes indispensable; through this, injections may be sent, so as to come in contact with the seat of the disease. These may be emollient or astringent, as the morbid condition may seem to demand.

In the more chronic forms, when the violence of the symptoms has mainly abated, and the mucus is free—except on extraordinary occasions—from admixture with blood, Sir Benjamin Brodie has employed injections of dilute nitric acid, with great benefit. At first, the proportion ought not to be greater than one minim of the acid of the pharmacopœia, to two ounces of distilled water; but afterwards it may be doubled. He has not found it safe to go beyond this strength. Sir Benjamin advises, that the bladder should be first washed out with a little tepid water: the acid solution should then be injected, and be allowed to remain for not more than thirty seconds. At first, the injection should not be repeated oftener than once every two days; but afterwards it may be repeated every day, but never more frequently. Should the urine drawn off by the catheter, be tinged with blood, the injection should be deferred until the following day, and if it be followed by pain, or phenomena indicative of an increase of inflammation, it ought not to be had recourse to until they have subsided.

Injections of tar-water, along with the internal use of turpentine, have been strongly recommended on the high authority of M. Dupuytren. The tar-water was made by infusing in the cold, for a night, a pound of tar in ten pounds of spring water, filtering and warming the solution before using it. Large quantities of this were injected through an elastic gum catheter, which was forthwith withdrawn, and the patient directed to retain the injection as long as possible. It was repeated daily. Venice turpentine was given internally in the form of pill.[a] The iodide of iron would make an excellent injection in such cases.[b]

[a] R.—Terebenth. Venet.
Pulv. glycyrrhiz. āā. ʒss.—
M. et divide in pilulas xxiv.
Two to be taken three times a day.

[b] R.—Ferri iodid. ʒj.
Aquæ Oij.—M.

Injections of soot have likewise been employed with great benefit. Two ounces of compact wood-soot were taken from the chimney, broken, washed, and boiled in a pound of water. The decoction was filtered through paper, and injected into the bladder twice a day. In six cases, recorded by M. André Gibrin, the good effects supervened closely on the administration of the remedy; the pain ceased, and the patients obtained sleep to which they had been for some time strangers. The urine gradually became clear, and recovered its natural appearance. Testimony has been given by others in regard to injections of soot in this disease, but some do not speak in an equally favourable manner in regard to it. Soot is necessarily very variable in its character; and, therefore, must be uncertain in its action. At times, indeed, it would appear to have given rise to great increase of irritation in the inflamed membrane.

Of late, it has been proposed to cauterize the interior of the bladder in the following manner. Professor Lallemand takes a large catheter of pure silver,—for if there be any alloy the caustic acts upon it,—which is open at both ends, and has two kinds of stylets, according to the part which it is desired to cauterize. At the extremity of the stylet is a small excavation, containing solid nitrate of silver, which is first pulverized, and then placed in the excavation over a spirit lamp: this fuses and moulds it to the cavity. When the instrument is prepared, an ordinary catheter is introduced into the bladder, in order to empty it completely. This precaution is necessary, as the urine would dissolve the caustic, and prevent it from directly affecting the mucous membrane. When this has been withdrawn, the instrument bearing the caustic is to be introduced closed; and the moment it has entered the bladder, the stylet must be pushed, and the *porte-caustique* be rapidly turned from side to side, two or three times; the stylet must then be pulled into the instrument, and withdrawn,—the object being to touch the surface in as many points as possible. Whilst the instrument is within, the bladder contracts and grasps it, and the kidneys secrete a small quantity of urine. This, however, is advantageous, as it acts as a vehicle to the portion which it does not decompose, and conveys it equally over the surface of the membrane. At the moment, the patient usually feels a sharp pain at the neck of the bladder and in the rectum, described as not unlike a pinch, but much more supportable than the continued dull pain of chronic catarrh. There is now an irresistible desire to pass the urine; and, as the bladder is nearly empty, very little is voided, and this causes a burning sensation along the urethra, accompanied by some drops of blood. The desire is renewed every moment, causing violent but useless efforts. These gradually decrease; and on the second or third day, there is no longer any pain in making water, and a few small gray eschars, like burned paper, come away with the urine. In the majority of cases, it is said, one cauterization is sufficient for a cure. M. Lallemand affirms that he has never found a fourth application of the caustic re-

quired. Dr. O'Bryen affirms, that the advantages of this mode of practice are very great, when cases, suited for it, are selected. It is always inadmissible, when the kidneys or prostate are diseased.

Impressed with the great success that attended the application of the solid nitrate of silver in the hands of M. Lallemand, Dr. Robert L. MacDonnell, of Montreal, was led to employ the nitrate in solution as an injection; and the results of his experience induce him to state most explicitly, "that as far as pure uncomplicated chronic inflammation of the bladder is concerned, the opprobrium has been removed from surgery, and that we do possess a method of treatment followed by a greater amount of success than usually attends remedies employed in diseases of so severe and intractable a nature, and infinitely greater than attends the use of any remedy in a disease hitherto considered by the first authorities as incurable." The advantages which Dr. MacDonnell considers the solution to possess over the solid nitrate of silver, are:—*first.* That it can be employed of various strengths, from one to four grains to the ounce, or even stronger, if necessary. *Secondly.* We may be certain, that the application comes in contact with the whole diseased surface. *Thirdly.* We may also be satisfied, that it does not act more violently on one part than another. *Fourthly.* It is more readily employed by an inexperienced operator; and, above all, it cannot be attended with any risk, "from the apprehension of which it is not easy to divest the mind when using the *porte-caustique* of Lallemand; and, together with the above advantages, it has this also to recommend it, that it will be found at least equally successful." Dr. MacDonnell's plan of injecting is as follows:—he first cleanses out the bladder of any fetid urine and mucus, which it may contain, by injecting water into it of the temperature of 98°. The solution of the same temperature is then injected, and allowed to remain for about a minute, care being taken, by compressing the urethra, to prevent its being forcibly rejected by the violent straining which is certain to be induced. The quantity of water or of solution injected should never exceed four ounces, owing to the irritable state of the bladder. The patient is then ordered a warm bath, and should the urine become bloody, or mixed with shreddy concretions, frequent fomentations and anodynes must be directed; but these accidents seldom last longer than a few hours. The injection may be repeated in the course of a few days, should this be necessary.

In the treatment of these cases, great aid is derived from the microscope; for, long after the naked eye fails to detect pus or blood in the urine, these fluids are recognisable by that instrument; and so long as they are present Dr. MacDonnell considers that the treatment should not be relaxed.

II. IRRITABILITY OF THE BLADDER.

Synon. Cysterethismus, Irritabilitas vesicæ, Irritable bladder.

Irritability of the bladder is occasionally a distressing affection, and one which is by no means easy of removal. It is often, too, symptomatic of diseases of other parts, and requires, consequently, great care in the diagnosis, or rather in the etiology.

Diagnosis.—There is generally pain in the region of the bladder, which shoots in various directions to the back, anus, thighs, and along the urethra. This is commonly aggravated by the presence of urine in the organ, so that the patient is often called upon several times in the course of the night, and more frequently, perhaps, throughout the day, to evacuate the urine, which he does with great pain and difficulty,—*Dysury*, Ger. *Schwerharnen*;—and drop by drop,—*Strangury*, Ger. *Harnzwang*. Where the disease is idiopathic, and consists in impressibility of the nerves of the organ, constituting *Neuralgia of the bladder*, the urine may not, at first, present any appearance different from the healthy condition; but as some degree of inflammation is apt to be induced sooner or later in the lining membrane, it may have constituents that are foreign to it—such as an unusual quantity of mucus or pus. The irritation, too, may be extended to the kidney, and a copious precipitate be thrown down, which may consist of one or other of the calculous depositions before mentioned; or a granular condition of the kidney may be developed. On the other hand, as elsewhere shown, this last pathological condition may give occasion to the affection now under consideration. Under the constant irritation, kept up by this impressibility of the bladder, the general health always suffers; the appetite becomes diminished; the spirits are depressed, and all the functions are carried on in disorder; so that nutrition is impaired, and more or less emaciation is the consequence.

At times, but rarely, acute pain and sense of constriction are experienced in the region of the bladder, stretching occasionally forwards to the urethra; with globular contraction of the organ, retention of urine, frequent urgent calls to evacuate the rectum, often attended with protrusion of the bowel; excessive anxiety; restlessness, and clammy perspiration, but without fever or tenderness on pressing the hypogastrium. This is the affection known under the name—*Spasm of the bladder*, *Spasmus vesicæ*, *Cystospasmus*, *Ischuria spasmodica*; Fr. *Spasme de la vessie*; Ger. *Blasenkrampf*. It may occur at any age, but is most frequently seen in old people, and requires the vigorous employment of narcotics for its removal. If not arrested by appropriate measures, it may terminate fatally with the usual symptoms of suppression of urine.

Causes.—The causes of irritability of the bladder are numerous. It may unquestionably be induced by unusual impressibility, or by a neuropathic condition of the viscus, as well as by chronic inflammation of its parietes; but is most commonly developed by irritation seated elsewhere. The believers in the doctrine of spinal irritation would refer it, occasionally, to a morbid condition of the part of the spinal marrow with which the nerves of the bladder are connected. Of this pathological condition, we have not, however, sufficient evidence. It appears, indeed, to be more commonly owing to irritation either in the bladder or some other organ, which is conveyed to the spinal marrow, and reflected upon the nerves of the bladder. It is, unquestionably, also, a common symptom of renal disease. It has been suggested by Dr. Robert Willis, that the influence of this kind of sympathy in leading to errors in diagnosis has been exaggerated. The author thinks not;

and the very fact of the patient's being called out of bed to pass his urine more frequently than in health has led him, in many cases, to inquire into the condition of the secreting organ,—by examining the state of the urine and the different functional phenomena of the kidneys, which have proved that the primary source of the vesical disorder was there. His experience leads him, indeed, to the conclusion of Sir Benjamin Brodie, that a very large proportion of the cases, which have been usually confounded together under the general appellation of irritable bladder, are of renal origin; and that in many instances, in which the bladder was actually diseased, it was not so at first,—the vesical disease being altogether secondary, and might never have existed if there had not been previous disease of the kidneys.

The first impression on the part of the practitioner when great irritability of the bladder exists is, that the organ contains some extraneous body; the catheter is, consequently, introduced at the expense, frequently, of excessive suffering. The affection is, doubtless, often caused by the presence of calculus in that viscus. It may, also, be induced by disease of the prostate; by calculi in the kidney or ureter; by the use of irritating articles of diet;—by stimulating diuretics,—as turpentine and cantharides, either taken internally, or absorbed from a blistered surface; by the introduction of bougies, &c. &c. It is likewise sometimes induced by the pregnant condition, and by the pressure of the fœtal head during parturition, as well as by prolapsus uteri.

Treatment.—After what has been said of the various causes that may occasion irritability of the bladder, it is obvious, that the first step towards the treatment is to appreciate those accurately, and to attack the primary affection where this is practicable. It need scarcely be said that every article of diet or medicine which may induce irritation, and, consequently, all high-seasoned food, and every therapeutical agent, which we know to be absorbed into the circulation, and to pass off by the kidneys, should be carefully avoided. Demulcent drinks, and feculaceous aliments, with a moderate proportion of unsalted animal food; the hip-bath; the occasional application of cups, with the scarificator, to the lumbar or sacral region, or of leeches to the perinæum; the use of gentle laxatives, as castor oil, (f℥i.—f℥iij.); of emollient, and starch and laudanum, glysters; and of opiates to allay irritation, constitutes the essential treatment. Here again, uva ursi and diosma have been advised, but the observations already made on those tonic astringents are equally applicable to their employment in the affection under consideration.

In the irritability of bladder of the female, the author has found great advantage from a maintenance of the recumbent posture; the adoption of the general treatment just indicated, and the application of a solution of the nitrate of silver to the meatus urinarius.

℞.—Argent. nitrat. gr. vj.
Aquæ f℥j.—M.

It has also been recommended to throw injections into the bladder —as of warm water, flaxseed tea, weak mucilage of gum arabic, &c. Generally, these injections are at first retained but for a short period, and are, at times, suddenly and forcibly returned; but, by a perseve-

rance in their use, once or twice a day, along with the plan recommended above, and the use of revellents, as of the ointment of tartarized antimony to the lumbar or sacral region, the power of retention becomes gradually greater, and recovery is ultimately effected. At times, indeed, revulsion appears to effect a cure, when all therapeutical agents have been employed in vain. This is strikingly the case in married females, who become pregnant whilst suffering under this malady. The erethism induced in the uterine organs detracts from that seated in the bladder, and the disease disappears, never, perhaps, to return, as the period of utero-gestation is sufficiently long to break in permanently upon the morbid impressibility of the vesical nerves.

Where the neuralgic condition has been of long continuance, it may be occasionally removed by a rigid persistence in the plan of treatment advised under Neuralgia.

To prevent the strangury or spasm of the bladder,—*Cystospasmus, Ischuria spasmodica*,—induced by blisters, it is but necessary, as remarked under another head, to cover the blister with tissue-paper, which prevents the absorption of the cantharidin; and not to permit the blistering ointment to remain on so long that the cuticle may be broken, and the cantharides come in immediate contact with the denuded skin. Some have advised, in the way of prevention, that the surface of the blister should be covered with the *tinctura camphoræ;* and Dr. Morton, of Philadelphia, affirms, that since he has adopted the plan of mixing camphor and opium with the blistering ointment, he has never met with a severe case of strangury, and very rarely with even a partial one. For a plaster, five or six inches square, he directs twelve grains of the former, and four of the latter, to be rubbed up with the *ceratum cantharidis.* The preventive plan, recommended by the author, has, however, proved effectual in every instance in which he has employed it. When strangury has actually supervened, the use of warm diluents,—or demulcent drinks, which, in reality, act simply as diluents,—with hot fomentations applied to the hypogastrium or perinæum, or both, are generally successful in affording full relief.

III. RETENTION OF URINE.

Synon. Retentio urinæ, Paruria Retentionis vesicalis, Ischuria vesicalis; *Fr.* Rétention d'Urine; *Ger.* Harnverhaltung.

The term *retention of urine* may, with propriety, be restricted to inability to pass the urine from the bladder. An obstruction to the flow of urine may, indeed, exist in the ureter or urethra, but these are rare cases, and need not interfere with the general definition.

Diagnosis.—The patient, on attempting to pass the contents of the bladder, finds that he is unable to do so; he repeats his efforts until he is fatigued, and discovers them to be fruitless. At the same time, pain exists in the hypogastrium, which extends to the lumbar region and to the thighs. The pain above the os pubis is increased by pressure, and the desire to pass the urine is rendered by it more urgent. The bladder, except in the extremely corpulent, and even in them, can generally be felt above the pubis, in the form of a large ball, and yields

a dull sound on percussion. Sometimes, it reaches as high as the umbilicus; and, at times, it has acquired such dimensions, in the more chronic forms of the disease, that the patient has been supposed to be affected with ascites, and it has even been proposed to tap him.

Along with the local symptoms, the general system usually exhibits its participation in the morbid influences, and there is more or less febrile disorder, thirst, and occasionally severe headache, with marked anxiety of countenance.

The great source of danger in retention of urine is supposed to be —the bursting of the bladder; but more apprehension ought to be entertained of peritonitis. The bladder is capable of containing a very large quantity of fluid, and instances are on record, where 16 pints and upwards have been evacuated. A case is stated by Dr. Mackintosh, of a woman, in whom the urine—during a second attack of retention—escaped at the umbilicus, in consequence of the fundus of the bladder having become attached by adhesive inflammation to the peritoneum corresponding to the umbilicus, and ulceration having taken place through it. Four years previous to this attack, the woman had experienced retention of urine for four days before she was relieved by the catheter, when 16 pints were evacuated. From the strength of the adhesion between the fundus of the bladder and the umbilicus, it appeared that the adhesion must have taken place at that period.

Causes.—Retention of urine may be caused by a mechanical obstacle seated about the neck of the bladder, or in the course of the urethra. It may likewise be owing to inflammation of the mucous membrane at the neck of the bladder, and to a spasmodic contraction of the muscles, which act as sphincters. Paralysis or want of expulsive power may produce the same result. This may be induced by overdistension of the bladder. In old persons, the condition is not uncommon; and it is often produced in them—as has been suggested by M. Rostan—by the wear and tear of the organism,—the nervous system, having become obtunded. Occasionally, the loss of power occurs and disappears in a manner not easy of explanation. In a case described by Sir Benjamin Brodie, a gentleman, a lawyer by profession, of sedentary habits, and nervous temperament, observed, that he had not the usual desire to void his urine, and that when he did void it, it was in a very small stream, and in small quantity. On the following day, he passed none at all; but he had at the same time no inclination, and, therefore, did not suffer. On the following day, being still in the same condition, he thought it prudent to consult a surgeon; not on account of his experiencing either pain or uneasiness, for he had neither; but because he knew—as he expressed it—that all could not be right. A catheter was introduced, which entered the bladder without the slightest difficulty, and drew off a large washhand-basinful of urine. It soon became again collected in the bladder, and the catheter was again had recourse to. The operation was repeated night and morning for a few days, after which the patient regained the lost power, and was soon able to evacuate the contents of the bladder as usual. Retention of urine is, however, only one of the signs of para-

lysis of the bladder; incontinence of urine and cystirrhœa may likewise be induced by it. When the paralysis affects the neck of the bladder, and not the body, the latter may contract, and the former being relaxed there is incontinence of urine: on the contrary, if the sphincter be unimpaired, and the body paralysed, there may be retention of urine. Loss of power, on the part of the muscular coat of the bladder, may likewise be dependent upon spinal mischief, from mechanical or from organic lesions. M. L. A. Mercier, who has inquired carefully into the causes of retention and incontinence of urine in old persons, has arrived at the following conclusions:—*First*, excepting the cases in which there is disease of the brain or spinal marrow, or general prostration of the whole economy, incontinence and retention of urine in old people depend, almost exclusively, on hypertrophy of the prostate. *Secondly*, The more equally and regularly the hypertrophy invades the prostate in all parts, the greater will be the disposition to incontinence of urine. *Thirdly*, The more partial and irregular the hypertrophy, the greater the disposition to retention of urine; and, *lastly*, in conditions intermediate between the two preceding, *regorgement* of urine is most commonly seen. By the term *regorgement*, M. Mercier means:—when the bladder has attained a certain degree of distension, and the urine flows *guttatim*, and constantly, without the organ augmenting or diminishing in any sensible manner.

Retention of urine occurs in the female under two chief circumstances;—in the early months of utero-gestation, in cases of retroversion and anteversion; and, after delivery, owing to the previous pressure of the child's head upon the urethra and neck of the bladder. In the former case, the withdrawal of the urine from the bladder is an essential part of the treatment; and, in the latter, the operation is equally necessary; but the author has never met with a case, after delivery, where no serious injury had been inflicted, in which the bladder did not resume its functions in the course of a few days. Retention is also observed as an accompaniment of hysteria, but, in this case, as suggested by Sir Benjamin Brodie, the pathological condition differs from that of simple paralysis of the bladder. It does not appear, that, in the first instance, the nerves are rendered incapable of conveying the stimulus of volition, but that the effort of volition is itself wanting,—corresponding with what is observed in cases of loss of voice, and in many other morbid affections connected with hysteria. As the distension of the bladder increases, the patient begins to be uneasy, and at last suffers actual pain; volition is then exercised as usual, and the bladder begins to expel its contents. "Thus," says Sir Benjamin, "if the bladder be not relieved artificially, by the introduction of the catheter, the hysterical retention of urine is usually of short duration. If, however, the catheter be had recourse to, the natural cure is prevented, and the existence of the disease may be prolonged for an indefinite period of time—for weeks or even months."

Pathological Characters.—These must, of course, vary according to the cause of the retention; but often, the bladder may present no

unusual appearances, or it may exhibit increased capacity, caused by constant over-distension.

Treatment.—This must vary according to the pathological condition which gives rise to the retention. If any mechanical obstacle to the passage of the urine be seated either at the neck of the bladder or in the course of the urethra, it may be necessary to pass the catheter; or if, owing to stricture or other causes, this be impracticable, the surgeon may be called upon either to force the passage—as has been advised by many of the French surgeons—or to puncture the bladder, either above the pubis or from the rectum.

Should the retention be owing to inflammatory congestion about the neck of the bladder, it may be advisable, especially if the patient be robust, to draw blood from the general system; and the operation may be followed up by the application of leeches to the perinæum; with the general warm bath, or the semicupium, and a full dose of an opiate. Should these means not succeed, a bougie or catheter may be introduced; but it is well to postpone them, until the other means have failed; and, at the same time, not to permit the retention to continue so long as to run the risk of serious mischief. Where the retention is owing to loss of power on the part of the muscular coat of the bladder, the catheter should always be introduced early. It has been a question here, again, whether it should be reintroduced once or twice in the twenty-four hours, or be retained in the bladder, —plugged, so that the urine may be discharged every now and then. There can be no question, that if the instrument be passed with great pain and difficulty, it had better be left in; unless, indeed, its continued presence should excite too much irritation.

Uva ursi and diosma crenata have been advised in these cases,—as, indeed, in almost all affections of the urinary organs,—no matter how different they may be pathologically; but, as elsewhere remarked, they are mere tonico-astringents, and unworthy of much reliance. The same may be said of substances, which act on the urinary organs as diuretics. Any increase of the urinary secretion cannot fail to do harm whilst the vesical retention exists; and, therefore, cantharides, advised by some, are objectionable. The author has found decided advantage from the application of a blister to the sacrum, dressed endermically with strychnia, (gr. ¼—ss., night and morning.)

M. Lisfranc found the direct application of the tincture of cantharides to the interior of the bladder remove paralysis of the organ after all other means had failed. One drop of the tincture was let into the bladder through a catheter; and this was followed by an injection of lukewarm water. On the following day, two drops were instilled in the same manner; and the operation was repeated, night and morning, for several succeeding days,—a drop of the tincture being added on each successive occasion. A cure was soon effected; and M. Lisfranc did not find, that any perceptible local irritation resulted from the use of the tincture in an undiluted state; whilst the direct application of the remedy was clearly preferable, in every respect, to its internal administration.

M. Allier fils, from having observed—as he believed—contraction

of the fibres of the bladder under the administration of ergot, has recommended it strongly in cases of retention of urine; and feels himself justified in inferring, from the results of varied observation, that it is capable of restoring to the bladder the contractility it may have lost owing to immoderate distension of its coats by urine;—that its action has been evinced in cases in which this kind of paralysis has resisted known therapeutical agents; and that, owing to the fugacious character of its operation, it ought to be administered at short intervals, in broken doses, and these long continued. Many cases have been published of late years, in which its efficacy appeared to have been decided.

℞.—Ergot. ℥j.—divide in partes vj. æquales.
One, every three hours. The quantity may be raised to 40 grains in the day, and be discontinued by degrees after the cure, to consolidate it.

In the retention of urine, that accompanies hysteria, as the disease is owing rather to want of volition than to paralysis, no special treatment directed to the bladder is generally necessary. It may happen, however, that owing to over-distension the organ may really lose its power; and in such case the introduction of the catheter becomes indispensable. It may be remarked, by the way, that the noise of the water, poured from one vessel into another, occasions, at times, the bladder to contract. This, it has been properly suggested by Dr. Mackintosh, can only be effected—it is to be presumed—when the retention is induced by a spasmodic affection near the neck of the bladder, or by a general paralysis of the fibres of the organ. The author knew it to be entirely successful in one case, in which a tumour had been extirpated from the lining membrane of the rectum, and retention followed the operation. If the use of the catheter can be obviated by so simple an expedient, it is well that it should be tried.

During the retention, and subsequently, the patient ought not to drink fluids freely, and whenever a desire arises to evacuate the bladder, it ought to be instantaneously obeyed.

IV. INCONTINENCE OF URINE.

Synon. Paruria Incontinens, Incontinentia Urinæ, Enuresis, Hyperuresis, Mictio inopportuna, Uracratia, Excretio Urinæ involuntaria, Mictio involuntaria; *Fr.* Incontinence d'Urine; *Ger.* Unwillkürlicher Harnfluss, Unwillkürlicher Abgang des Urins, Unvermögen den Urin zu halten.

A want of power to retain the urine, or rather an involuntary discharge of urine, is a common phenomenon in diseases affecting sensation; but, in such case, it is altogether symptomatic, and its consideration belongs to other heads. It is not unfrequently, however, a morbid condition dependent upon the state of the bladder itself, and to be combated by remedies directed to that organ. It is met with in children prior to the age of puberty especially, and often during sleep alone; and, like retention, it may be an evidence of paralysis of the bladder. This can be readily understood. When the bladder has experienced a certain degree of distension, the urine, subsequently sent into it, is slowly discharged, or dribbles away through the urethra, so that a superficial observer might be deceived, and overlook the distension or regorgement of the bladder, which precedes and accom-

panies the incontinence. This is the form often met with in the aged; and as it is subordinate to the retention, it can only be remedied by removing the original derangement, and restoring the tone of the bladder, so as to enable it to evacuate its contents. This—it need scarcely be said—is by no means an easy task, where the powers of the bladder have become impaired by the progress of life.

Under Retention of Urine, it was remarked, that incontinence is apt to occur in the aged, when the prostate is hypertrophied equally and regularly in all parts.

Incontinence of urine occurs, occasionally, from injury to the spinal marrow and the nerves proceeding from it; and hence, it is a common phenomenon in paraplegia. In some of these cases, paralysis of the bladder, and retention accompany the incontinence; but in other cases, there seems to be unusual impressibility of the nerves of the bladder, so that the contact of a small portion of urine may be sufficient to excite the muscular coat to contraction. At other times, again, foreign substances,—as gravel or sand,—irritate the nerves, when not unusually impressible; and it can be readily understood, that mechanical pressure by the fœtal head, during parturition, may lead to the same results.

In children, nocturnal incontinence is a frequent occurrence, and one that gives occasion to much annoyance to both child and parent. It almost always disappears in the course of a few years,—usually long prior to the period of puberty; but, at times, persists even afterwards. "In this kind of incontinence,"—Dr. Willis remarks,—"the urinary secretion and excretion are invariably and alike deranged; not only are the calls to make water more frequent and pressing than in health, but the urine is always more copious and of lower specific gravity than is proper; it very rarely contains the due proportion of characteristic animal ingredients, but is colourless and watery." "The disease, therefore, does not depend"—he adds—"on the higher irritability which has been held the appanage of early life; such irritability would not attach to the detrusor fibres of the bladder only, but to those of the sphincters also, by which the balance would be maintained; it is, in fact, generally associated with derangement in the secreting faculty of the kidney, which must be corrected, in order that the evil may be removed." This is plausible; but it is proper to state, that the author has had no reason for believing that the secretion and excretion are "invariably and alike diseased."

Irritation in the vicinity of the bladder,—as in the rectum, and in the vagina of females,—may alike be the cause of incontinence.

Treatment.—The management of incontinence of urine must vary materially, according to the cause. If it be found to arise from paralysis of the muscular coat of the bladder, an examination must be made to discover, whether there be a tumour above the pubis, or any other signs of retention; and if such exists, the treatment, advised under the head of Retention of Urine, will be appropriate.

If the nerves of the bladder have lost their power, owing to disease within the spinal sheath, the treatment must be directed to modify the primary affection. With this view, powerful revellents,—as the moxa,

successive blisters, or the actual cautery applied on each side of the spinous processes of the lumbar vertebræ—or blisters, dressed afterwards endermically with strychnia, (gr. $\frac{1}{4}$,—gr. ss.), night and morning, hold out the best expectations of relief. The treatment is, indeed, identical with that required in retention of urine from loss of tone in the muscular coat of the bladder. Cantharides have been especially prescribed.[a] Dr. Guy has recommended them strongly, associated with tincture of opium or tincture of hyoscyamus, in the case of young persons; and alludes to four cases that had been promptly relieved, and ultimately cured under this medication.[b] The internal use of nux vomica or strychnia[c] has likewise proved serviceable; and, of late, the nitrate of potassa, in doses of 10 grains every three or four hours, with flaxseed tea to drink, has been highly extolled by Dr. J. Young, of Chester, Pennsylvania, and since him by Dr. Delcour, of Verviers.

[a] R.—Tinct. cantharid. gtt. x. ter. die;
or,
R.—Pulv. cantharid. gr. $\frac{3}{4}$—gr. j.
Ext. gentian. seu
— hyoscyam. gr. iij. f. pil ter die sumenda.

[b] R.—Tinct. cantharid. ℥ij.—iv.
— opii seu
— hyoscyam. v.—xv.—M.
To be taken three or four times a day in sugared water.

[c] R.—Ext. alcohol. nucis vomicæ gr. j.—iij. f. pil. ter die sumend.;
or,
R.—Strychniæ gr. j.
Ext. gent. gr. xxx. Divide in pil. xii.
Dose, one, three times a day.

Benzoic acid has also been advised by Dr. Delcour and Dr. Fraene. In the case of a girl, 13 years of age, in whom the disease had lasted four months,—after three weeks of unavailing treatment, the latter gentleman gave six grains of benzoic acid, night and morning. On the fifth day, she took twenty-four grains: the next night the complaint disappeared, and did not return. The remedy was, however, continued for some days after.

Where the incontinence is owing to an acrid condition of the urine, or to irritating substances of a mechanical nature contained in it, diluents may be freely allowed. It is the custom, in such cases, to prescribe demulcents, as gum arabic water, slippery elm or linseed tea, &c. &c.; but—as elsewhere remarked—they probably act only as so much simple fluid, the mucilaginous portion being digested, and the aqueous alone passing into the blood-vessels, to be separated by the kidneys.

It need scarcely be said, that if calculous depositions be the source of irritation or inflammation about the neck of the bladder, a treatment appropriate to gravel and to cystitis is demanded. The use of injections of plain water into the bladder has been recommended;—the water being blood-warm at first, and, as the irritability diminishes, the temperature being gradually lowered to that of the atmosphere. From four to six ounces can be borne at first, but the quantity must be thrown in slowly, and the operator should cease, if the patient complain of any uneasiness, or the slightest impediment exist; otherwise the organ may be excited to spasmodic action. If the patient can retain the fluid, it may be permitted to remain, and be discharged

in the usual way; but if it cause uneasiness, it should be allowed to pass through the tube. If pain be produced, the operation will do more harm than good; but if it be borne well, Dr. Lendrick advises, that it be repeated from once a week to once daily.

Incontinence of urine in children is the source of much anxiety to parents, as well as to the sufferers themselves. The author has seen many cases; and his experience has been similar to that of Dr. Morton, of Philadelphia, in regard to the good effects of waking the child at stated intervals, for the purpose of evacuating the bladder. The organ becomes, in this manner, gradually accustomed to the stimulus of the urine, until, ultimately, the night can be passed without inconvenience. If not broken in upon effectually at an early period, it may persist for years. It was the expressed opinion of a distinguished individual, Sir Charles Bell, that the urine is never discharged, except when the child is asleep on his back; and, hence, that the cure is a simple one:—he must accustom himself to sleep on his face or side: "the urine," he adds, "is not passed, nor is he excited to dream of making urine while he keeps this position." The view of Sir Charles ought to be kept in mind, but it is not, probably, of as extensive application as he supposed. It can be readily understood, that if a habit have been acquired of passing the urine during sleep in any one position, a change of position, by modifying the sensations, may interfere with it; but the effect would probably be only temporary; and hence,—as has been properly remarked by Dr. Willis,—whoever trusts to position alone, for the cure of incontinence of urine among children, will be sure to be disappointed. One important part of the management is—to diminish the quantity of fluid used at supper, and even to dispense with the meal altogether. Tonics, astringents, and excitants of the most varied kind have been suggested, with the whole train of internal and external treatment recommended in cases of paralysis of the bladder; and, for a time, the new impressions made by them are favourable. Blisters, especially, and the various forms of counter-irritants—either by the irritation they induce or the dread occasioned by them—keep the child awake, and, in this manner, may prevent the incontinence for a time, but the effect is apt to wear off, and the habit to recur.

It has been advised, in very obstinate cases, where all the other means have failed, to introduce a bougie into the bladder; and some have recommended, that it should be coated at the point with a stimulating substance, as the tincture of cantharides, applied in layers, one coat being permitted to dry before the other is laid on. The cases must be rare, indeed, where such a severe remedy could be considered necessary; and the same may be said of the different *juga*, and other mechanical contrivances, which have been applied for the purpose of preventing the passage of the urine. Some risk always attends their employment, and they do not strike at the root of the mischief. Dr. Willis thinks the best of the mechanical contrivances is that in which a firm, but not a hard, pad is kept applied, by means of a spring, to the urethra in the perinæum. "I am even willing," he remarks, "to allow, that considerable benefit may be derived from this apparatus, in

some cases of incontinence, and though not permitted to be worn habitually, it may sometimes be recommended to young persons at particular times,—as when they are visiting from home, to insure them against the occurrence of their infirmity." It has been proposed, also, to apply the nitrate of silver to the orifice of the urethra, so as to excite acute inflammation of the part;—and a successful case is reported by E. W. Duffin. When the urine passed over the inflamed surface, the pain produced by it was sufficient to awaken the patient, and arouse the sphincter vesicæ to the performance of its function. The caustic was repeated, and a cure shortly effected.

For habitual incontinence in the adult, or the aged, urinals are so contrived as to receive the urine of the male very readily; and where it is passed incontinently in the female, either owing to paralysis of the bladder, to sloughing of the organ, or to any causes of incontinence, a sponge may be so adapted to the parts as to receive the fluid as it passes away.

In cases of exstrophy of the bladder, a great source of inconvenience is the perpetual stillicidium that takes place from the exposed ureters. This inconvenience, also, may be palliated by sponges properly adapted to the part.

V. CALCULUS IN THE BLADDER.

Synon. Calculus vesicæ; *Fr.* Calcul vésical; *Ger.* Blasenstein.

The different varieties of urinary calculi, and the method of preventing their formation, were investigated under the head of Calculous Formations in the Kidney. It is, therefore, but necessary to describe here the phenomena caused by them, and the appropriate management when they remain, and accumulate in the interior of the bladder.

Diagnosis.—The symptoms, that denote the existence of calculus in the bladder, are—a frequent desire to pass the urine, with itching or an uneasy feeling in the glans, and in the region of the bladder. This feeling in the glans sooner or later becomes very acute, and affords an example of the sympathy of continuity by which irritation may not be as much felt in the part of a mucous membrane, which is itself irritated, as at the point where the membrane commingles with the skin; and of which we have an analogous example in the itching at the nose, experienced by children labouring under irritation of the intestinal tube.

The character of the discharged urine varies. It may deposit any of the varieties of sediment, referred to under a former head; or its appearance may be natural—the deposition taking place slowly on a calculous formation already in the bladder. If the calculus be so small as to insinuate itself into the commencement of the urethra, the urine may only be discharged *guttatim*, with great pain and straining; or if larger, it may pass to the vesical orifice of the urethra, whilst the urine is flowing in a full stream, and arrest it suddenly. This is one of the best single signs of calculus within the bladder; and the evidence is greatly confirmed, provided the flow be restored by change of position. Some patients are not able to pass their urine, unless they are on the

side; and cases have existed in which others have been unable to evacuate the bladder unless they were on the head, and in almost a vertical position. These are the symptoms usually present, but stones have been found in the bladder on dissection, where there had been little or no previous suffering; and, in severe cases, the pain may not always be present. After a long interval of entire or comparative ease, hard riding or severe concussion of the body, of any kind,—by changing the position of a calculus, which has been seated in a part of the bladder, that has become accustomed to its presence,—may give rise to an exacerbation, which may be accompanied by intense suffering. It rarely, indeed, happens, that the suffering is always equally severe,—and hence the expression—*a fit of the stone*, as we speak of *a fit of the gravel*—to denote the exacerbation.

When the symptoms are at their greatest severity, the pain is excessive; the urine is passed by drops with intense agony; and contains mucus, and frequently blood—especially in the last portions that are voided. The pain and itching of the glans penis causes the patient—especially if a child—to pull constantly at the prepuce, which is thus frequently elongated.

It is to be expected, that the prolonged anguish, which attends this—one of the most painful of disorders—must interfere greatly with the general health. The patient is prevented from obtaining a due amount of rest; the appetite fails; the whole system of nutrition becomes morbidly implicated; and death may supervene, induced by protracted irritation, which wears away the powers of life.

Although it might be presumed, that the symptoms of calculus are sufficiently unequivocal, it is proper to remark, that unfortunate errors have been committed by even experienced observers, and that the operation of lithotomy has been performed, where no stone has been found in the bladder. A striking case of the difficulty, that occasionally environs the subject, has been given by one of the most eminent of living surgeons. Sir Benjamin Brodie was consulted in the case of a boy between four and five years of age, who had a constant inclination to pass his urine, and who shrieked from pain as the urine flowed. He was perpetually squeezing the extremity of the penis between his fingers, and the urine was frequently tinged with blood. Sir Benjamin examined the boy again and again, and finally determined that there was no stone in the bladder. An occasional dose of calomel and rhubarb, with one of rhubarb and the *sulphas potassæ cum sulphure* in the intervals, dispelled all the symptoms in a few weeks. In such cases, the facts, before referred to, should be recollected; which show, that vesical irritation not unfrequently acknowledges a renal origin. In all cases of doubt in regard to the symptoms, it is of course indispensable, that the sound should be introduced into the bladder, but cases have occurred, where even experienced surgeons have been deceived, when this precaution has been repeatedly adopted, and where they have performed the operation of lithotomy without any calculus being present in the bladder.

Pathological Characters.—The appearances, presented by the bladder of one who has died of calculus, may be various. The usual signs of

inflammation of the mucous membrane may be expected; and the bladder may be more or less thickened, and diminished in size, in consequence of the inability to retain more than a certain quantity of urine. Morbid appearances may, likewise, be found in neighbouring organs,—as in the kidney, ureters, and prostate. The latter organ is sometimes greatly enlarged, and even ulcerated. The suffering, under such circumstances, is intense.

The calculus itself presents various characters, according to the precise deposition, that may be for the time existent. Most commonly, the nucleus is lithic acid, and it has been presumed by many, that this has proceeded from the kidney and been detained in the bladder. Generally, however, if the renal calculus clear the ureter, it will succeed in passing through the urethra; and, so far as the author has had an opportunity of observing, the nucleus itself has usually been formed in the bladder. A clot of blood or any extraneous matter may be the cause of deposition, especially if the individual be, at the time, suffering under a calculous diathesis. In the same calculus, it is found, that the chemical nature of the deposition varies at different periods of its increment. If the nucleus be lithic acid, the deposition sooner or later becomes phosphatic, in the generality of cases. If the disease be recent, and the urine acid,—reddening litmus paper,—we may infer that the calculus is of lithic acid; but if the symptoms of calculus have existed long, and been very severe, so as to affect the general habit, and the urine be at the same time alkaline, it may be presumed, that the phosphates are being deposited. In many cases, all doubt is removed by the deposition of sabulous matter in the utensil, which can be discriminated by the rules laid down under Renal Calculi.

Treatment.—At all times, it has been a subject of anxious endeavour to discover a mode of breaking down or dissolving stone in the bladder; and at the present day the ardour has not abated. Yet, the mass of the profession are of opinion, that whenever the stone becomes too large to be discharged *per vias naturales*, it can only be removed by an operation. The fact, that every urinary calculus may, and generally does, consist of layers of different chemical composition, would seem to render the problem very difficult of solution.

The different *lithonthriptics*—as they are termed—which have been brought forward from time to time, are of extremely questionable virtues. Of the mineral waters that have been esteemed powerful agents in the removal of vesical calculi, the Vichy have been perhaps most celebrated; and their properties have been recently canvassed by scientific observers, whose opinions are worthy of all attention. The fact, that these waters render the urine alkaline, could not fail to suggest their application in calculous affections. It would not appear, that the destruction of calculi by this water is effected merely, or perhaps principally, in the way of solution, but that it is accomplished in a very considerable degree, especially as regards those of the triple phosphates, by a kind of disintegration of their component particles. When calculi consist of the oxalate or phosphate of lime, mingled

with lithic acid, lithate of ammonia, or the triple phosphate, the Vichy water is said to attack and disintegrate them rapidly. Vichy water contains a large amount of free carbonic acid, and nearly a drachm and a half of the bicarbonate of soda in every thousand drachms of the menstruum. Its action on calculi in the bladder seems to have resembled, in many cases, that which we have described as resulting from its application to them out of the body. M. Petit, of Vichy, has a collection of calculous nuclei, which were passed by patients suffering under stone, for which they drank these waters. The nuclei are said to show, generally, traces of solution or disintegration on their surface; and some of them appear to have unquestionably undergone a very considerable reduction in size and weight since the commencement of the treatment. This action cannot be regarded as the result of simple dilution, as the waters act much more rapidly on lithic acid, lithate of ammonia, and the triple phosphate, than pure water. Besides greatly increasing the quantity of the urine, they exert a decided influence on its chemical constitution; rendering it rapidly neutral if previously acid, and afterwards alkaline: from being high-coloured it becomes pale, and, having deposited copiously, it becomes limpid and transparent. The experience of many observers is certainly encouraging, and suggests the importance of employing the fictitious waters of Vichy, where the natural water is unattainable. For these, the following formula is given in the *Codex Medicamentarius*, of Paris.

Take of simple acidulous water, impregnated with twice its bulk of
Carbonic acid ℥xxss.
Carbonate of soda gr. xxxij.
Sulphate of soda gr. xvj.
Chloride of sodium gr. iv.
Carbonate of magnesia gr. ss.
Chloride of iron gr. ¼.—M.

Under views analogous to those which have directed the use of the alkaline mineral waters, the different alkalies and alkaline earths have been freely administered as lithonthriptics. It is not probable, however, that either the mineral waters in question, or the alkalies, can be generally productive of benefit, except where the depositions are of the lithic acid or the lithates. Still, the facts must be borne in mind, that under protracted administration of the waters, and likewise of alkalies, combined with the free use of diluents, calculi of other kinds have experienced disintegration. Where, too, they have failed to dissolve or break down the calculus, they would seem to have greatly mitigated the suffering; but in what manner this is effected, it is not easy to determine. It may, indeed, be a question how far, in the cases narrated, the relief was dependent upon the remedy administered. It is proper, however, to remark, that an eminent investigator of calculous diseases, M. Leroy d'Etiolles, states, that a certain number of calculi, instead of being dissolved by alkalies administered in baths or drinks, increase under their influence—at times, by the addition of a double salt of lithate of soda and ammonia; at others, by the precipitation of a lithate of lime; at others, by a more rapid deposition of the phosphates

of lime, ammonia and magnesia; and, at others, again, by the formation of a carbonate of lime, which may add to the calculi already existing, or give place to depositions of a new kind. M. Leroy's statement has been contested, since which he has adduced cases to show, that after the treatment of urinary calculi by the alkalies, carbonate of lime has been found on analysis in them; and he argues, that as carbonate of lime scarcely ever exists in urinary calculi, its frequent presence, after the alkaline treatment, can only proceed from the carbonate of soda, the acid of which combines with the lime of the calculus and of the urine.

Acids—as elsewhere remarked—are given as antilithics; but very rarely as lithonthriptics, unless when thrown into the bladder. Both alkalies and acids have, indeed, been injected into that viscus; and although cases of benefit derived from them have been published,—owing to the varying composition of the calculi, great caution has to be exerted in order to determine when either one or the other, or neither, is appropriate. Moreover, if the solutions be sufficiently strong to exert any effect upon the calculus, they can scarcely fail to induce irritation of the bladder, and an aggravation of all the symptoms.

In the Proceedings of the Royal Society of London, (No. 56,) an abstract is given of some researches on the decomposition and disintegration of phosphatic vesical calculi, and on the introduction of chemical decomponents into the living bladder, by Mr. S. Elliot Hoskins. The object of his researches was to discover some chemical agent, more energetic in its action on certain varieties of human calculi, and less irritating when injected into the bladder than any of the fluids hitherto employed. These indications not being fulfilled by dilute acids, or other solvents, which act by single elective affinity, Mr. Hoskins investigated the effects of complex affinity in producing decomposition. For this purpose, an agent is required, the base of which should unite with the acid of the calculus, whilst the acid of the former should combine and form soluble salts with the base of the latter. The combined acids would thereby be set free in definite proportions, to be neutralized in their nascent state, and removed out of the sphere of action, before any stimulating effect could be exerted on the animal tissue. These intentions, Mr. Hoskins considers to have been fulfilled by the employment of weak solutions of some of the vegetable supersalts of lead, such as the supermalate, saccharate, lactate, &c.; but he gives the preference to an acid saccharate—the nitro-saccharate of lead. The salt must be moistened with a few drops of acetic, or of its own proper acid, previous to solution in water; and the decomposing liquid should not exceed in strength one grain of the salt to each fluidounce of water. The chemical effects of these decomponents Mr. Hoskins has tried out of the body, and the results certainly encourage their employment in the form of injections into the bladder.

Mr. A. Ure has suggested the use of an injection of carbonate of lithia, which occurs as a constituent of various mineral waters—those of the Kreuzbrunnen of Marienbad; of the Obersalzbrunnen in Silesia, and of the Franzensbrunnen at Eger. As urate or lithate of lithia is

the most soluble salt which the lithic acid forms, it has been thought by Dr. Ure an advisable injection in cases of the lithic acid calculus. It is proper to remark, however, that he has never actually tried it, excepting on calculi out of the bladder—its extreme scarcity having prevented him. He suggests, however, the importance of its preparation to the pharmaceutical chemist.

At one time, it was supposed that galvanic electricity might be brought to bear on vesical calculi; but experience has not sanctioned the supposition, and it is not now regarded.

A case has been recorded by M. Ségalas, in which spontaneous softening of a calculus had occurred. Eleven days before its extraction by the high operation, it was so hard as to resist the lithotritic instrument; but when removed, it was found to be softened on its exterior to the consistence of paste, and yielded under the pressure of the forceps even to its very centre. The calculus was found on analysis, by M. Lecanu, to be composed of phosphate of lime and animal matter, and the softening coincided with catarrhal inflammation of the bladder.

Should all means of destroying the calculus fail, it must be removed either by the operation of lithotrity or of lithotomy. If there be reason, however, to presume, that the calculus is very small—small enough to pass through the urethra—it has been suggested to allow diluents, and medicines according to the circumstances of the case; and that the patient—with his bladder full of urine—and resting on his hands and knees, should repeatedly endeavour to detach the calculus by moving or shaking the pelvis from side to side, or up and down; and that he should then make water suddenly, and in as full a stream as possible. The following plan, too, has been recommended. Let a large bougie be introduced into the bladder, and be retained there. Then let the patient drink freely of some mild diluent, so that the bladder may become loaded with urine. When he can bear the distension of the bladder no longer, let him place a vessel on a chair, and, leaning forward over it, withdraw the bougie. The urine will follow in a full stream, and the calculus may probably accompany it. This mode of treatment, it is affirmed by Sir B. Brodie, has been successful in removing calculi, for which an experienced surgeon had recommended the patient to undergo the operation of lithotomy.

When the calculi cannot be got rid of, and the patient is unwilling to submit to the painful operations of lithotrity or lithotomy, or the case is not one that is considered to be appropriate for them, palliatives are demanded: opium, or some of its preparations, become indispensable, with perfect quiet and the warm bath, or semicupium. Anodyne injections into the rectum likewise afford essential benefit.

On the whole, the medical treatment of vesical calculi consists of a combination of that required in cases of calculous depositions in general, and of that demanded in cystitis, combined with narcotics in such doses as to allay the excessive pain, often induced by the calculus, especially if it be of rough exterior, which is one of the characteristics of the mulberry calculus especially.

VI. BLOOD IN THE URINE.

Synon. Hæmaturia, Hæmaturesis, Mictus cruentus, M. sanguineus, Urina sanguinea, Hæmorrhagia Hæmaturia, Bloody Urine; *Fr.* Hématurie, Pissement de Sang; *Ger.* Blutharnen.

Blood, mixed with the urine, may proceed from different parts of the urinary organs; and it is not always an easy matter to decide as to its precise source. Usually, it is symptomatic of some morbid condition; but, like other hemorrhages, it may occur, if not as an idiopathic affection, as one whose immediate morbid cause it is not easy to detect.

Diagnosis.—This is generally a matter of no difficulty. Frequently, the blood is coagulated; at other times, it subsides to the bottom of the vessel in a form not to be mistaken; but, at others, high-coloured urine may be thought to be bloody. It has, likewise, been observed to issue from the urethra in the form of concrete fibrinous and solid coagula, which have imposed upon superficial observers, who have taken them for worms. At times, too, these coagula would seem to have been detained in the urethra, where they have had a channel formed in them by the urine, and have ultimately been discharged in the form of tubes of greater or less capacity, and representing sufficiently well the dimensions of the canal. The blood may be so thoroughly mixed with the urine, that doubts may exist as to its presence. Under such circumstances, if it be permitted to rest for some hours, the blood may be deposited, so that the urine, which was previously turbid, will become clear. At the bottom and around the sides of the vessel, a slight layer of colouring matter is deposited, which, when put on linen or paper, tinges it red: such is usually the case even when the urine contains blood in small quantity. If nitric acid be added to the urine a copious precipitate will be thrown down, and if a heat above 169° be applied to the urine, the albumen of the blood will be coagulated, and deposited with the fibrin. When examined under the microscope, blood-corpuscles will be discovered, which are insoluble in water and nitric acid, and soluble in acetic acid.

Causes.—The most common causes of hæmaturia are of a mechanical kind;—for example, calculi impacted in the kidney, ureter, or urinary bladder. It may, likewise, be induced by blows on the loins or abdomen, and by violent inflammation of the urinary organs,—although transudations of blood, under the last pathological conditions, are not as common as in the inflammation of other mucous membranes. Occasionally, hæmaturia is an indication of malignant disease of the kidney, and also of fungosities at the inner surface, and especially near the neck of the bladder. It occurs, too, as symptomatic of disease of the prostate gland, and of the lining membrane of the urethra.

When the blood proceeds from the urethra, *Caulorrhagia stillatitia*, *Hæmaturia stillatitia*, *Urethrorrhagia*, *Urethrohæmorrhagia*, Ger. *Harnrohrenblutfluss*, *Bluttripper*, it usually flows out, both when the urine is passed and in the intervals; and when it is discharged with the urine it is not mixed intimately with that fluid. Moreover, the history of the case will generally lead to a correct appreciation. It frequently

accompanies manifest disease of the prostate, or follows the introduction of some instrument into, or mechanical violence done to, the canal of the urethra. Calculi, especially if rough on the surface, may lacerate the membrane in their passage. In cases of severe inflammation of the lining membrane of the urethra, whether simple or specific, should blood be discharged, the nature of the attendant symptoms cannot fail to indicate its source. When the blood transudes from the vessels of the bladder, *Cystorrhagia*, *Hæmaturia cystica*, *Hæmorrhagia vesicæ*, *Stranguria cruenta;* Ger. *Blasenblutfluss*, there is generally more or less uneasiness in the region of that viscus. In such case, the blood is not always mixed intimately with the urine, but swims upon it in irregularly-shaped clots, the rest of the fluid being clear, or but slightly turbid. On standing, the blood is deposited at the bottom and sides of the utensil. When the transudation occurs in the kidneys, *Nephrorrhagia*, *Hæmaturia renalis*, *Hæmorrhagia renum;* Ger. *Nierenblutfluss*, there may be no signs of uneasiness in the region of the bladder, or in the urethra; yet it must be borne in mind, that the renal condition, which gives rise to it, may be accompanied with symptoms that are referred to the bladder. Usually, perhaps, there is pain or uneasiness in the lumbar region. In this case, the blood is mixed intimately with the urine:—distilling, as it does, from the pelvis of the kidney, it cannot fail, in its course down the ureter, to become closely incorporated with the urine, which, when discharged from the bladder, has a blood-red appearance, not in part, but wholly.

It need scarcely be said, that the presence of symptoms of nephritis or of cystitis, with the appearances of the urine above-mentioned, will aid in the differential diagnosis.

It would seem, that in cases of amenorrhœa, a vicarious discharge sometimes takes place from the urinary organs; and a similar discharge, especially from the urethra, has been noticed in the course of purpura hæmorrhagica. Bloody urine, has, likewise, been observed to follow the use of cantharides internally; and it is not an uncommon consequence of the internal administration of the oleum terebinthinæ in rheumatic and other cases.

An endemic and chronic variety of hæmaturia prevails, according to M. Rayer, at the Ile Maurice and in Brazil, affecting children especially.

Pathological Characters.—There are none, which belong essentially to hæmaturia. They must of course vary with the cause and seat of the affection. Careful inspection may indicate the precise part of the passages from which it proceeds. In the kidney, in cases of hæmaturia, and at times when no blood appears in the urine, a condition has been seen, which is termed by M. Rayer *renal apoplexy.* It is characterized by the presence, on the surface of the affected kidney, of knotty, irregular tuberculated eminences, some of a deep black colour, others of a chamois-coloured tint, more or less pure or variegated with black parts:—all or almost all the eminences being surrounded by deep-brown lines. Under a lens, the substance of the kidney appears swollen with black blood.

Treatment.—This, too, must differ according to the seat of hemor-

rhage, and the condition of the system. No matter whence it proceeds, if the transudation be accompanied with active symptoms, it must be treated as active hemorrhage proceeding from any other mucous membrane. Blood may be taken from the arm, or by means of cupping or leeching from the loins, perinæum, or verge of the anus; perfect rest be enjoined, with a dry diet; and cold injections be thrown into the rectum. On the other hand, should the transudation be owing to thinness of blood, or to the condition of solids that characterizes purpura, the remedies become necessary, that are elsewhere shown to be appropriate in that morbid condition. In such case, along with the ordinary remedies for arresting atonic hemorrhage, the iodide of iron will be found a valuable agent: (*Liquor. potassii iodidi*, gtt. xv., ter die.) It possesses not only tonic properties, but adds to the coagulability of the blood;—increases, in other words, the action of the system of nutrition of the vessels; prevents their parietes from being so permeable; and, by increasing the consistence of the blood, renders it less penetrative. The tincture of chloride of iron has likewise been strongly recommended in such cases; and, of late, gallic acid—two to four grains as a dose, in the form of pill—given every three hours—has been highly extolled.

In all cases, the bowels should be kept open by the oleum ricini or any other gentle laxative.

When hæmaturia succeeds to a sudden suppression of the menses or hemorrhoidal flux, it is advised, that we should do all in our power to restore those discharges,—a result by no means easily accomplished. We certainly have no remedy, which deserves the title of an emmenagogue, under all circumstances. Leeches may, however, be applied to the vulva or to the anus, and it has been advised, by M. Andral, to throw gently excitant vapours into the vagina. When the fluid coagulates in quantity in the bladder, and forms a solid mass, it has been recommended to introduce the catheter, in order to break down the clot. This must be practised with caution. It has, likewise, been advised to inject warm water into the bladder, to wash away the clots.

Where the discharge of blood takes place from the urethra, the hemorrhage may be controlled, if within reach, by pressing the canal between the finger and thumb, and afterwards applying a large compress to the part by means of a T bandage, so as to keep up the necessary degree of pressure. Generally, however, the seat of the hemorrhage is in the bulbous or prostatic portion of the urethra, where no pressure is available. The effect of cold applications to the perinæum and to the lining membrane of the rectum is generally, in such cases, marked.

VII. CANCER OF THE URINARY BLADDER.

Synon. Cancer vesicæ urinariæ; *Fr.* Cancer de la vessie; *Ger.* Blasenkrebs, Harnblasenkrebs, Krebs der Harnblase.

This affection is not common and it still less commonly attacks the bladder primarily. Usually, this viscus becomes implicated in cancerous affections, which commence in the rectum; and in the female,

in the uterus also. When it does appear, it is usually in conjunction with manifest indications of the cancerous diathesis.

Diagnosis.—The symptoms are those of chronic cystitis, generally accompanied by the presence of a hard, lancinating tumour in the hypogastrium; and the discharge of a purulent fluid in the urine, and frequently of blood,—with fragments of decomposed flesh exhaling a most repulsive odour.

The disease may be of protracted duration, but frequently runs its course rapidly.

Pathological Characters.—These are similar to what is observed in cancer of other internal organs. Where the tumour has begun in the bladder, it is usually found to have commenced in the submucous cellular tissue, whence it proceeds in other directions, occasionally passing outwards, and contracting adhesions with the sides of the pelvis, the uterus, and the bowels. These tumours are sometimes of a complicated nature,—scirrhous, cartilaginous, and fungous; and they have been found in great numbers at the internal surface of the bladder, and are of a soft medullary texture.

Treatment.—As the disease can generally be merely suspected during life, it can rarely be met by any appropriate treatment. When it is diagnosticated accurately, it must be treated like cancer of the kidney or of any other internal organ.

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